The

Electrical Review

VOL. CV. JULY 12, 1929. No. 2,694.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

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Telegraphic Address: "AGEEKAY, CENT, LONDON." Code, A B C. Telephone No.: Central 5871 (5 lines.)

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
Some Aspects of Hire-purchase	49
The E.R.A. and Electricity Supply	50
The New Peterborough Station	50
The General Electric Meeting	50
Electricity Tariff Standardisation, by G. Wilkinson *(illus.)*	51
The Peterborough Power Station *(illus.)*	53
Surge Protection, by E. T. Norris *(illus.)*	60
The Overhead Lines Association *(illus.)*	62
The E.H.P. Conference at Paris, by R. Borlase Matthews	65
Parliamentary News	66
Business and Industrial Notes	66
Lighting and Power Notes	70
Tramway and Railway Notes	72
Telegraph and Telephone Notes	73
Radio Notes	73
Contract Information	74
Forthcoming Events	75
Notes	75
Institution Notes	77
Our Personal Column	77
Financial Section—	
New Companies Registered	78
Official Returns of Electrical Companies	79
City Notes	79
Stocks and Shares	81
Swiss Foreign Electrical Trade	83
Trade of British Malaya	84
The Institution of Mechanical Engineers *(illus.)*	85
A Shipbuilders' Joint Meeting *(illus.)*	88
Development in the Uses of Electricity, by R. P. Sloan	88
Tramways & Light Railways Association *(illus.)*	89
The Modern Tramcar, by G. H. Fletcher	90
New Electrical Devices, Fittings, and Plant *(illus.)*	93
Legal	94
Correspondence—	
Lady Demonstrators	94
Lamp Trading	94
The I.E.E. in France	94
Domestic Supply Tariffs	94
Water Heating Extraordinary	95
A Unique Stamp	95
Published Specifications	95
New Work for Contractors	97

Some Aspects of Hire-purchase.

IT is now generally conceded that a system of deferred payments by consumers for their electrical installations is necessary, if substantial progress is to be made in certain directions, for example in domestic and rural electrification.

The hire-purchase of apparatus takes a leading position in the terms of reference of a committee recently appointed by the Electricity Commissioners, as reported in the ELECTRICAL REVIEW for March 22nd, 1929, p. 519. This method of meeting the needs of consumers on terms acceptable to the majority, who cannot conveniently pay the full cash value of the apparatus, has received our consistent support and was considered at length in our issue for December 16th, 1927, p. 1021, when we also summarised an investigation into the subject made by one of our leading banks.

On the other hand, there are many people who entertain grave doubts as to the correctness of the method of payment by instalments. In some cases there is a deeply engrained antipathy, of a quasi-ethical nature, towards a system that encourages the enjoyment of something before its full price has been paid. It is most desirable that ideas on this matter should be clarified. The engineer, whose duty it may be to execute a scheme of hire-purchase, should not harbour a suspicion that he is engaged in a not altogether creditable transaction; the consumer, who desires to dispense with a coal-fired oven in favour of an electric cooker, should not suffer a twinge of conscience due to the thought that he is lacking in thrift by mortgaging some part of future income in return for present satisfaction. Thrift is the basis of our economic system, and any scheme that threatened to undermine that basis would not receive our support. In our view the effect of popularising hire-purchase would be to promote thrift. The test is whether the article desired is of such a value to the purchaser that he would, given the requisite will power, be willing and able to save up to buy it at some future date. If that is the case, purchase by instalments is justified. The need to meet the periodic payments makes saving compulsory and thus enables those with less self-restraint to receive the same "rewards of abstinence" as those of a more ascetic temperament.

A further advantage to the purchaser of a general

adoption of hire-purchase would be the cheapening of goods that would follow a larger scale of production made possible by increased demand, as the reduction in costs would, no doubt, be more than enough to discount the additional cost of interest, &c., over the amount now charged for cash purchase. It has also been claimed that costs are reduced by the equalisation of production throughout the year. The purchaser need have no fear that he will be called upon to pay for the possible defalcations of others, as the risk of bad debts is one that can almost be ignored. We have no reliable figures as to the extent of cover required for this purpose in Great Britain, but in the United States of America the loss on this account is authoritatively stated to be less than 0.2 per cent. of the capital cost.

Instalment buying is no new thing in Great Britain. Indeed, the antipathy felt towards it by some probably arises out of its abuse in the remote past, when it had a vogue mainly among ignorant and credulous persons.

It should be noted that less than a century ago there was the same opposition towards the use of credit for production as now exists in some cases towards its use for consumption. It is, in fact, customary to draw the dividing line of legitimate employment of credit between production and consumption. An advance on this position is discrimination between necessities and luxuries; but this also appears unsuitable, since—with a constantly advancing standard of material civilisation—"the luxury of yesterday is the comfort of to-day and the necessity of to-morrow."

We suggest that the real difference lies not between production and its inverse, consumption; nor yet between luxuries and necessities; but between that which administers to welfare and that which is inimical to welfare. In other words, we return to John Ruskin's distinction between "wealth" and "illth."

The E.R.A. and Electricity Supply.

IN our leading article of June 14th we referred to the need for the more liberal support of the British Electrical and Allied Industries Research Association. We also enumerated some of the ways in which research has benefited and—assuming proper financial backing—will continue to benefit the electricity supply industry, by whom quite inadequate contributions have hitherto been made. It was our hope on that occasion to reach a wider public, in view of the interest we anticipated would be taken by members of electricity committees in reports of the I.M.E.A. Convention.

We make no apology for returning to the subject so soon, as subsequent information confirms our views as to the need for early action. Our assumption is that in writing for engineers we preach to the converted, yet none know better than engineers the width of the gulf that separates theoretical assent to a proposal from its translation into practice. The gulf is all the wider in this case, since there is added the difficulty of expressing technical requirements in terms sufficiently clear to convince the lay mind. We understand that the Electrical Research Association has now under consideration a scheme for making the task of municipal electrical engineers easier in this respect, and would suggest that every engineer responsible for an undertaking should meanwhile resolve his faith into works by preparing an atmosphere favourable to the support of more concrete representations on behalf of the Association.

In his speech at the I.M.E.A. dinner (reported in our issue of June 21st, p. 1125), Sir John Snell appealed for an annual contribution by the supply industry of an amount equivalent to £10 per £25,000 of revenue. We should like to make it clear that such a sum would be the minimum required for a mere subsistence by the E.R.A. In order that research may be carried out in a manner to compare with what is being done abroad, the £10 mentioned must be increased to £25. There are indications that the appeal is already meeting with a response, which we feel sure will gather momentum as soon as it has been reinforced by suitable publicity. The need for the publicity provides a complete refutation of the saying that "good wine needs no bush," since the talent available in Great Britain for research work, whether whole time or advisory, is at least equal to that possessed by other nations.

The New Peterborough Station.

SEVERAL claims of novelty are made for the new generating station of the Peterborough Corporation, to which we refer more fully elsewhere in this issue. The advantages of having the boiler and turbine rooms side by side, without a partition wall, need not be related. The outstanding feature of the station is the evidence of the advance in pulverised-fuel firing. It is pleasing to compare the spotlessly clean boiler and turbine rooms, with the dust-laden atmospheres around some of the earlier powdered-coal installations, while great credit is due to Mr. H. A. Nevill, the engineer and manager, and the other engineers and manufacturers concerned for the apparently effective manner in which the dust- and grit-discharge difficulties have been overcome.

In view of the tendency in this and other countries to favour the unit system of pulverised-fuel firing in recent years, the fact that the system adopted for the new station at Peterborough is the central or storage one, which was decided on after experience had been obtained with the unit system in the old station, is of particular interest. Nor does the plant seem to be lacking as regards efficiency; an overall thermal efficiency of 18 per cent. when using coal with a calorific value of only 9,000 B.th.u. per lb. is a creditable achievement.

An aspect which, we suggest, is well worthy of attention is brought to light when considering the coal costs at Peterborough. We refer to the ratio of the total coal costs to the freightage costs. The particularly low and undesirable figure represented by this ratio for the station in question is emphasised by the low cost, *i.e.*, the low grade of the fuel, and it raises the question to what extent can high freightage costs or lower grade fuel be entertained in order to reach a desirable ratio figure. The justification lies largely, if not wholly, in the coal cost per unit sold.

The General Electric Meeting.

SIR HUGO HIRST'S review of the past year's work of the General Electric Co., Ltd., was, as usual, full of interest to the outside public as well as to the shareholders. The continued progress of the company is a remarkable testimonial to the leadership of Sir Hugo over a period of forty years—a record of strenuous service which must surely be unequalled in the electrical industry. The maintenance of this progress will be safeguarded by Sir Hugo's "taking into partnership" Mr. M. J. Railing as joint managing director.

In things electrical both great and small the company has continued its pioneering work. In the great things, however, the rewards have been disproportionately small—a paradoxical state of affairs which other electrical manufacturing companies have experienced.

The 1,600,000 "British ordinary shares" remain unissued on the company's hands. Sir Hugo claimed that his efforts to maintain control of the company in British hands have been fully justified by the developments in a number of other important companies. Further action awaits the awakening of public opinion to the full significance of the matter.

Sir Hugo repeated the lessons which he had learned from his recent Australian tour and confessed that he had had to alter his views on many matters. This emphasises the necessity for representatives of British electrical manufacturers to make a closer study of the markets in which they desire to dispose of their goods. The Empire is *British* not *English*—a distinction which it would be well to appreciate. Our Dominions have their own ideas and predilections which must be considered if trade with them is to meet with success.

Electricity Tariff Standardisation.

The author maintains that unless the industry introduces a dual variable-voltage distribution system it will never succeed in appropriating the vast amount of heating business that awaits a really low tariff.

By G. WILKINSON, M.I.E.E., M.I.Mech.E., M.Cons.E.

ALTHOUGH not afforded an opportunity of taking part in the discussion on Mr. E. J. Jennings's paper* on the standardisation of methods of charging for electricity at the I.M.E.A. Convention at Torquay, the writer listened with interest to the observations of the speakers.

It is disappointing that no reference was made to one of the root causes of the amazing variety of tariffs, which not only perplex many who are in the business, but also raise alarm and suspicion in the minds of the public, which knows nothing of the technical aspect of the problem.

When electricity was supplied almost entirely for lighting purposes the tariffs were simple; later, when

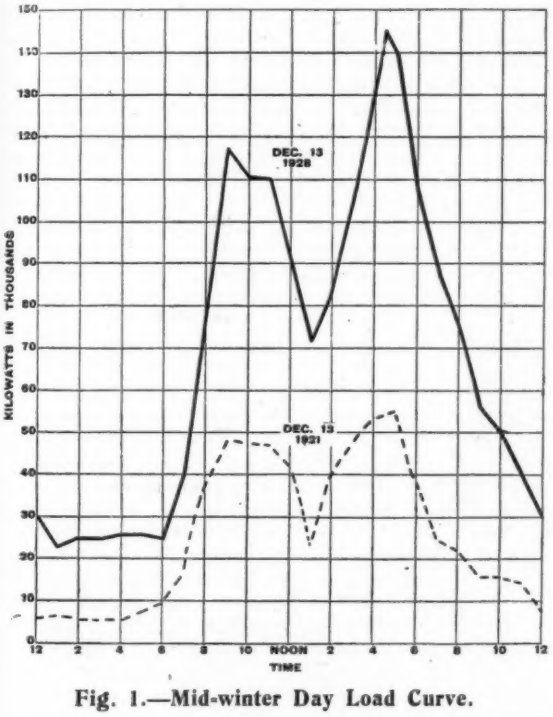


Fig. 1.—Mid-winter Day Load Curve.

used for motive power purposes which call for longer hours of service per day, reduced tariffs had to be adopted as competitive methods had to be faced and surmounted. This was comparatively easy and the equity of reduced charges for the longer-hour use was not difficult of proof, either to the member of committee or to the consumer. These fields of business are already well developed in many areas, and further increase of business has to be sought in the heating domain. Here successful competition with other well-known and efficient methods cannot be sustained if the charge for electricity supply is not very substantially reduced.

The supply station engineer is almost at his wits' end in endeavouring to diminish the cost of producing his constant-pressure supply to a point below the maximum price he is able to command for his heating current, in face of the moderate cost of producing the same by several other well-known and effective methods. In few cases is it possible to do this, and the anxiety of the engineer to accomplish this difficult task is portrayed in the multiplicity of tariffs put forward, many of which are ingenious, some grotesque, and others difficult to justify.

In some districts the situation is being aggravated by unwholesome stimulation in the form of assisted-wiring schemes and the hiring out of heating apparatus; thus users are frequently lured into a deal upon which they are happy until they receive their first quarter's account. The heavy expense of their venture, which is thus so painfully brought home to them, compels a course of irritating economy in the use of electric heat-consuming devices, until from sheer weariness of the situation they give notice to the supply authority to remove the gear, and the authority will ere long become saddled with old stock, *i.e.*, lost capital. In addition, it will be faced with a number of dissatisfied customers whose influence upon the whole community may be such as to damage every section of its business.

Notwithstanding the general call for standardisation and simplification of charges, it is clear that the conditions existing are such that the needed reforms are not practicable. The whole trouble lies in trying to build a big structure upon too small a foundation, which will not carry it, and the foundations must be widened and broadened.

Too long an enormous amount of technical skill has been expended upon the science of economic generation and the problem of distribution, neither of which embody the true solution of the present difficulties. The true solution lies in decreasing the cost of production, so that the present charges can be substantially reduced, and upon this line alone can simplification and standardisation of charges be effected. In other words, we must cease to be satisfied with conditions which enable us to employ the generating plant on full duty for one or two hours a day only, while the plant is kept in commission the whole 24 hours round, and actually operates at a loss for a considerable portion of this time. Clever men have endeavoured for over 30 years to bring this desirable and necessary change about by supplying the electric energy at constant voltage only, whereas the pressing reform can be reached in about as many months if a dual low-pressure supply is instituted.

It has already been shown in your columns that such a dual method will not only reduce the cost of the constant-voltage supply substantially, but also enable electricity to be sold for heating purposes at a lucrative figure, which the general public can afford to pay for the service.†

In the example set forth in the article referred to, the reduction in the cost of electricity supplied to the constant-pressure consumers amounts to 22 per cent., and the total increase in revenue when the variable-pressure supply is sold at the low figure of 0.33d. per kWh amounts to 70 per cent., *viz.*, an increase in revenue from £120 a day to £208, and this without any alteration whatever in the cost to the electricity supply authorities in the generating station beyond the small cost of the increased fuel consumption entailed in generating the extra units sold.

Many of the more modern works could reduce the 0.33d. to 0.25d. for heating current and still realise a handsome profit on the proceeds.

It is on these lines only that effective standardisation of the methods of charging for electricity can be based and satisfactorily effected. Methods of absorbing and usefully employing the variable-pressure electrical energy during the daytime are of recent date and are

* ELEC. REV., June 21st, 1929, pp. 1121-25.

† See ELEC. REV., March 15th, 1929.

not generally known. It is hoped to describe some of them in a future issue.

To sum up, satisfactory standardisation of tariffs is not possible at present because the cost of production is too high, and will so remain until electricity is supplied under conditions which will find continuous lucrative employment for the generating plant and high-pressure network. Further, the industry will not enter upon its full heritage and confer its maximum benefit upon the country until electricity is supplied at both constant and variable voltages. Under those conditions alone can tariffs be reduced, simplified, and standardised on a scale both favourable to successful competition with all competitive methods and at figures which the community can afford to pay for the service.

Load Curves.

Below are reproduced copies of the Birmingham load curves exhibited by Mr. Jennings with his paper, fig. 1 representing the output on a mid-winter day of 24 hours, *viz.*, on December 13th, 1928, and fig. 2 the output for a 24-hours day in mid-summer, *viz.*, on July 19th, 1928. By calculation, the load factor on the mid-winter day shown is 42.67 per cent., and in summer 28.82 per cent. only. From an examination of the two curves it

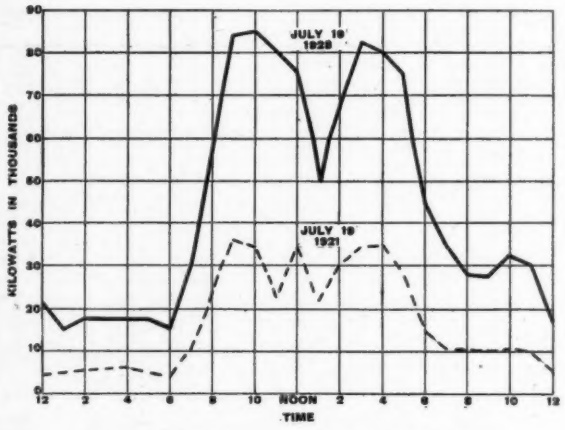


Fig. 2.—Mid-summer Day Load Curve.

will be seen that in the summer over 60,000 kW of generating plant is lying in the works entirely without employment; in other words, the capital represented by that plant is earning no revenue whatever, but the interest and sinking fund charges have to be met, and for the time being represent a dead loss to the undertaking.

The load-curves relate to one of the best managed undertakings which is operating in probably the best industrial area to be found in the country. With such a state of affairs is it any wonder that electrical energy, which is available at constant pressure only, is expensive and incapable of successful competition with other methods of supplying low-grade heat?

With a supplementary variable-pressure supply the load factor could easily be doubled, and useful work could also be found for the 60,000 kW of plant idle in the summer time for water heating where fires were not maintained in dwelling houses, offices and works. The current for such purposes, according to the published official fuel costs, could be sold with lucrative results at the low figure of 0.25d. per kWh, at which price, provided efficient heat-storage plant is employed, it will easily and successfully compete with any other known method of heat supply, thus supplementing the profits of the undertaking and conferring an immense boon upon the inhabitants of Birmingham.

Pending Obsolescence of Electric Tramways.

Already numbers of electric tramways have been abolished in favour of the more mobile and expeditious 'bus, and in the near future many more tramway routes will suffer the same fate. This will leave many miles of overhead traction lines without employment, which follow routes along the best avenues for business.

These lines should find profitable employment for the distribution of variable-pressure current for heating purposes, especially as they occupy thoroughfares in which it is inconvenient to lay additional mains underground; also they pass through localities where heating current will find a ready market.

Mains and Services.

The only objection which has been set up against the introduction of a dual low-pressure supply is that additional l.p. mains and services are required. This plea is put forward without mature consideration of the problem. Exactly the same objection, if it be a valid objection, applies with considerably greater force to the constant-pressure supply, but it is more or less obscured at present by the fact that undertakers are unable to secure the huge additional business awaiting them in the heating domain due to the necessarily high prices of constant-pressure supplies. In the highest developed areas the outer fringe only of this field has alone been touched and its acquisition will certainly entail the duplication of both l.p. mains and services, because in no case will the existing l.p. mains and services carry the additional loads.

Having regard to the greater facility of adoption and the lower capital cost involved, the variable-pressure alternative has overwhelming advantages, inasmuch as the maximum voltage is double that of the constant-pressure supply and therefore half the weight of copper is called for in both mains and services; moreover, on constant-pressure supply the authorities are under legal obligation to maintain a constant pressure within the limits of 4 per cent., while no such condition applies to variable-pressure supplementary supply. These features make variable-pressure supply less costly in first outlay than the alternative method, and in numbers of cases the distribution mains and services will be so small that they can be expeditiously and cheaply run overhead without being either obtrusive or unsightly.

Another important feature peculiar to variable-pressure supply is that a lucrative tariff can be fixed at so low a figure that all the available power will be absorbed by comparatively few customers, thus the network required for its disposal will be very much smaller, and therefore less costly than the alternative constant-pressure network.

It has already been shown that the low-grade heating business cannot be obtained at constant-pressure, due to the high cost; therefore the additional l.p. network may be avoided and in that case the industry must remain content to continue its development on what, for want of a better term, may be called the 20 per cent. or 25 per cent. load-factor class of business. This involves setting up more and more generating plant to use at full load for one or two hours a day only and to operate at an actual loss for a considerable part of each 24 hours, or to stand completely idle for such periods; or the continuance of high rates of charge for supply and the inability to secure the enormous amount of heating business which is awaiting in every area the advent of a really cheap electricity.

The comparison from the distribution point of view may be summarised as follows:—Presuming a certain area, at saturation point, required 100,000 kWh per 24 hours. On a 33 per cent. load-factor basis (an average which is a long way above that reached with the constant-pressure supply) the cost of distribution in mains and services may be represented by "x." With a 66 per cent. load-factor (an efficiency which can easily be reached and exceeded with dual l.p. supplies) the cost of both h.p. and l.p. mains and services in copper will be less than $\frac{1}{2}x$ with the same losses in transmission, as the maximum voltage on the variable-pressure distribution is double that of the declared constant-pressure supply. These facts should effectively dispose of any objection on the score of additional mains, as there are no grounds left upon which to sustain it.

The way to the "promised land" is by way of the dual low-pressure supply, and the sooner it is followed the better, both from the local and the national points of view.

The Peterborough Power Station.

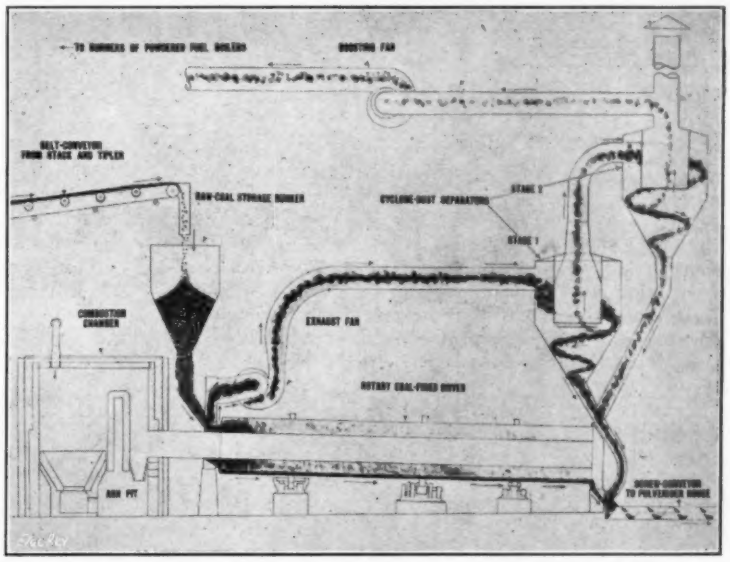
The recently opened generating station of the City of Peterborough Corporation represents important departures from standard practice in a number of respects.

PROBABLY the most important function of Peterborough's recent Civic Week, at any rate from an engineering point of view, was the official inauguration of the new electricity works by Prince George on June 28th. Actually the station has been running for several months. It is important and unusually interesting from several points of view. As a "selected" station it will hold a key position for an important and large East-Midland area. Arrangements have been made for it to feed into the "grid" at a point nearby, stepping up to 132 kV from the generating pressure of 6,600 V, and it will also supply by ring main the recently approved Lincolnshire electricity distribution scheme area, stepping up to 33,000 V. Furthermore, the station represents a considerable development in pulverised-fuel firing, being, it is believed, the only wholly public supply undertaking in this country which is entirely fired by pulverised fuel, without an alternative source of supply to the distribution system. Another point of outstanding interest is that the power station proper, *i.e.*, the turbine and boiler rooms, is arranged in what is to all intents and purposes one room, without partition walls, &c. Whilst greatly adding to the ease of supervision, this feature also marks a big stride in the development of pulverised-coal firing, in that it is very little exaggeration to say that the boiler and turbine sections are spotlessly clean. Some idea of the unusual arrangement may be gained from figs. 5 and 11, which show, respectively, the turbine and boiler plant in a full-length view of the station interior, and the back of the boilers with the base of one of the shafts and a portion of the turbine section, taken from the turbine floor. Another point of considerable interest is that the station is believed to be the only one in the world in which there is no storage of coal in any form in the boiler-house building.

Up to 1921 the Peterborough electricity undertaking was a very small one, using Lancashire boilers. In that year designs were prepared for a completely new station, and four Vickers-Spearing boilers, each rated to evaporate 25,000 lb. of steam per hour, with chain-grate stokers, were ordered. During the course of construction it was decided to install pulverised-fuel equipment, and accordingly the order for the stokers for two of the boilers was cancelled, and Simon-Carves unit-type pulverisers were installed in their place, although the setting of the boilers was so low that the combustion chambers were rather cramped. This plant went into commercial use in 1923 and continued to work until the end of 1927, when the present station came into operation and relieved the old station of its load. The old station, which is quite inadequate to meet the present demands, is now kept as a partial standby. Experience with the refractories in the combustion chambers of the pulverised-fuel-fired boilers led to the design and installation in 1925 of a special water-cooled combustion chamber for one of the boilers; it was, it is claimed, the first water-cooled combustion chamber to be installed in this country.

The advantages of pulverised fuel were clearly demonstrated in increased efficiency, ability to use lower grades of fuel and greatly increased evaporative capacity. In this connection it is worthy of note that while the stoker-fired boilers have never given any output beyond their rated capacity, the pulverised-fuel-fired boilers were regularly run up to 30,000 lb. per hour, and in one emergency steamed at 50,000 lb. per hour for a short period. During the four years in which the old station was in commission the pulverised-fuel-fired boilers evaporated 70 per cent. of the steam produced by the whole station. In view of the above it was decided to continue with pulverised fuel, but to adopt for the new station the central (storage) system.

Situated on the River Nen, the new station, fig. 4, is limited by virtue of the water supply to a capacity



Fif. 1.—Schematic Arrangement of Coal-drying Plant.

of 50,000 kW, but by means of cooling towers no doubt the ultimate capacity could be brought up to double that figure. Coal for the station is supplied from a siding on the Great Northern branch of the L.N.E. Railway. The wagons are emptied by a tippler into a hopper feeding a belt-conveyor which carries the coal to a hopper in the drying house or on to a stacking ground. From this the fuel is recovered by means of a grab crane which deposits it in a hopper over the conveyor. The coal-handling plant, fig. 13, was supplied by the Mitchell Conveyor and Transporter Co., Ltd. A stand-by plant consists of an electric locomotive and side-tipping wagons which discharge into the boot of the elevator to the drying plant. From the raw-coal hopper the fuel falls by gravity through an oscillating feeder controlling the rate of feed to the coal dryer. This is of the rotary-kiln type, heat for drying the coal being derived from a combustion chamber fired with pulverised fuel. The combustion is diluted by air, so as to get a suitable temperature, about 1,000 deg. F.

Secondary air is induced by the exhauster fan through ports in the walls and regulated by means of a series of dampers in the casing. The dryer, fig. 8, consists of two concentric steel cylinders approximately 45 ft. long and 7 ft. in outside diameter. The coal is fed into the annular space between the two cylinders,

and the rotation of the dryer at 4 r.p.m. lifts the coal by means of shower plates and so, owing to the inclination of the machine, propels the coal to the outlet end. The hot gases formed by the combustion of pulverised fuel with a large excess of air enter the inner shell of the dryer at a temperature of about 1,000 deg. F. After passing through the inner cylinder they return

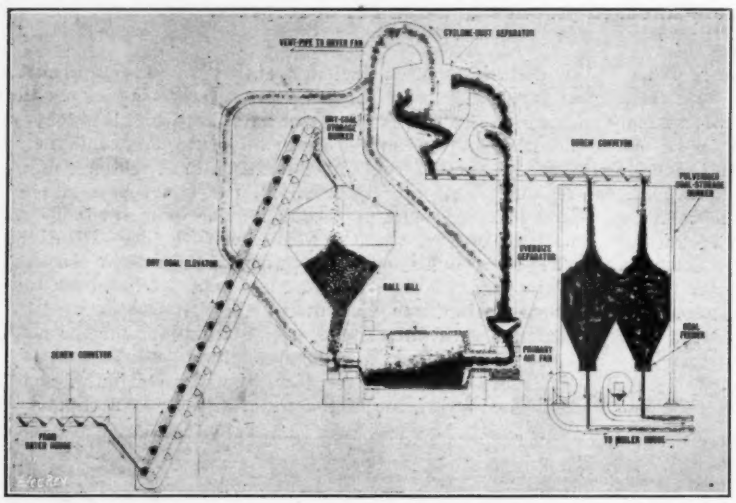


Fig. 2.—Diagrammatical Representation of Pulverising Equipment.

through the annular space in contact with, but countercurrent to, the coal. A temperature of about 700 deg. F. is maintained at the point where the gases leave the inner cylinder and enter the annular space, while after leaving the annular space at the inlet end they have been further reduced to about 175 deg. F. A constant-speed exhauster fan, controlled by a damper, draws these gases from the dryer and delivers them through two cyclones in series. The vent from the milling system is also led into these cyclones. Supplementary air plant, designed to stop the emission of coal dust from the dryer cyclones, draws these gases and delivers them to the boilers, the two centre burners of each being modified to receive the dust and air from the cyclones, fig. 10. By this means the nuisance arising from dust discharged from the dryer cyclones and the loss of coal from the same source is eliminated. The coal, which on leaving the dryer has a temperature of 260 deg. F., passes through a series of screw conveyors and an elevator, which deliver it into the dry-coal bunker in the adjacent pulverising house. From 2 to 3 per cent. of the raw coal is consumed in the dryer furnace, according to the moisture content, and the coal leaves the dryer with about 2 per cent. of moisture.

The coal is delivered by gravity from the dry-coal bunker into a Simon-Carves multiple-ball-type pulveriser, fig. 6, consisting of a cylindrical steel casing, approximately 12½ ft. long by 7 ft. across (diameter), with manganese-steel liners, in which a charge of 16 tons of specially hard steel balls is placed. The balls are of two sizes to start with, *viz.*, 80 and 40 mm. in diameter. The cylinder is revolved at the rate of 21 r.p.m. by means of a constant-speed motor through reduction gearing. A specially-designed exhauster fan draws air through the mill, which picks up the coal as soon as it is pulverised to a sufficient fineness and delivers it through a separator (in which any over-size material is trapped and returned to the mill) to a cyclone situated above the pulverised-coal bunker where the coal is separated out. The return from the cyclone is divided and delivers the air to the inlet and outlet ends of the mill in quantities determined by a series of dampers in the system. A vent is led from this return piping to the dryer cyclones as stated above. The fineness of grinding is such that 76 per cent. of the coal passes through a 200 mesh sieve, while not more than 2 per cent. is left on a 60 mesh sieve.

The pulverised coal from the cyclone is discharged into a screw conveyor which delivers it to any portion of the large pulverised-coal bunker, fig. 9; this is of 240 tons capacity and built up of mild-steel plates. It is divided into four sections and each section terminates in six outlet hoppers. This bunker has been designed and installed with a view to serving the complete station which will comprise six boilers each fired by four burners. At present only two boilers are installed, so that eight of the outlets are equipped with feeders, while the remaining sixteen are temporarily blanked. The feeders, each of which has a capacity of 5,000 lb. of pulverised coal per hour, are of the Simon-Carves' patent plate type, each consisting of a revolving spider which rotates between two fixed plates. In the upper of these there is a port through which coal from the bunker can fall by gravity into the spider. In the lower plate, diametrically opposed to this port, is an outlet through which the coal can fall by gravity when fed to it by the rotation of the spider. Each feeder is driven by a small variable-speed motor, and the coal falls down to an ejector in the primary air pipe. There is one primary air fan for each feeder driven by a constant-speed motor. The horizontal distance from the feeders to the boilers is about 190 ft. The mixture of primary air and coal is delivered through a cast-iron pipe to the burner on the boiler, the primary air pipes being placed along with the other pipes in an

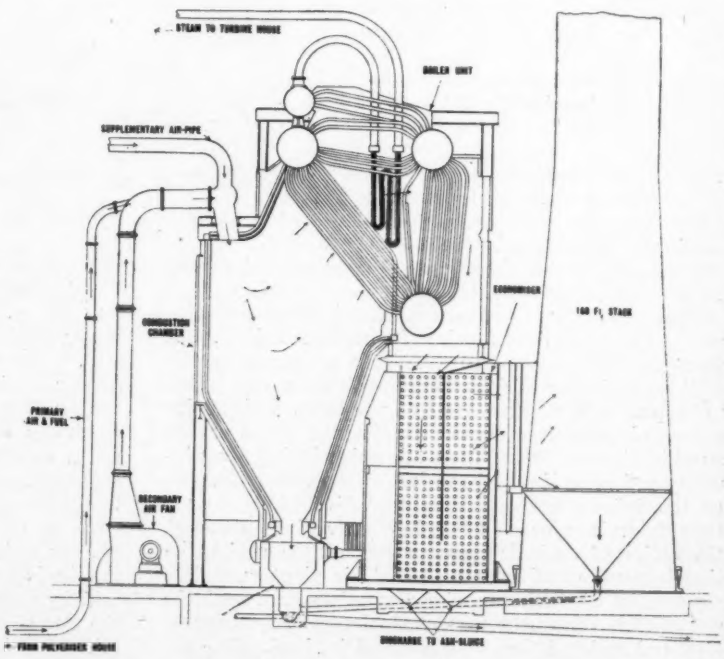


Fig. 3.—Lay-out Drawing of Boiler Installation.

underground culvert which also serves as an air duct for secondary air. Counters are fixed to each of the feeders, so that the coal can be measured by means of the revolutions of the feeders. Both primary air fans and feeders are remotely controlled from the boiler operating platform, the regulation of the coal feed being by means of a d.c. motor-driven feed disk.

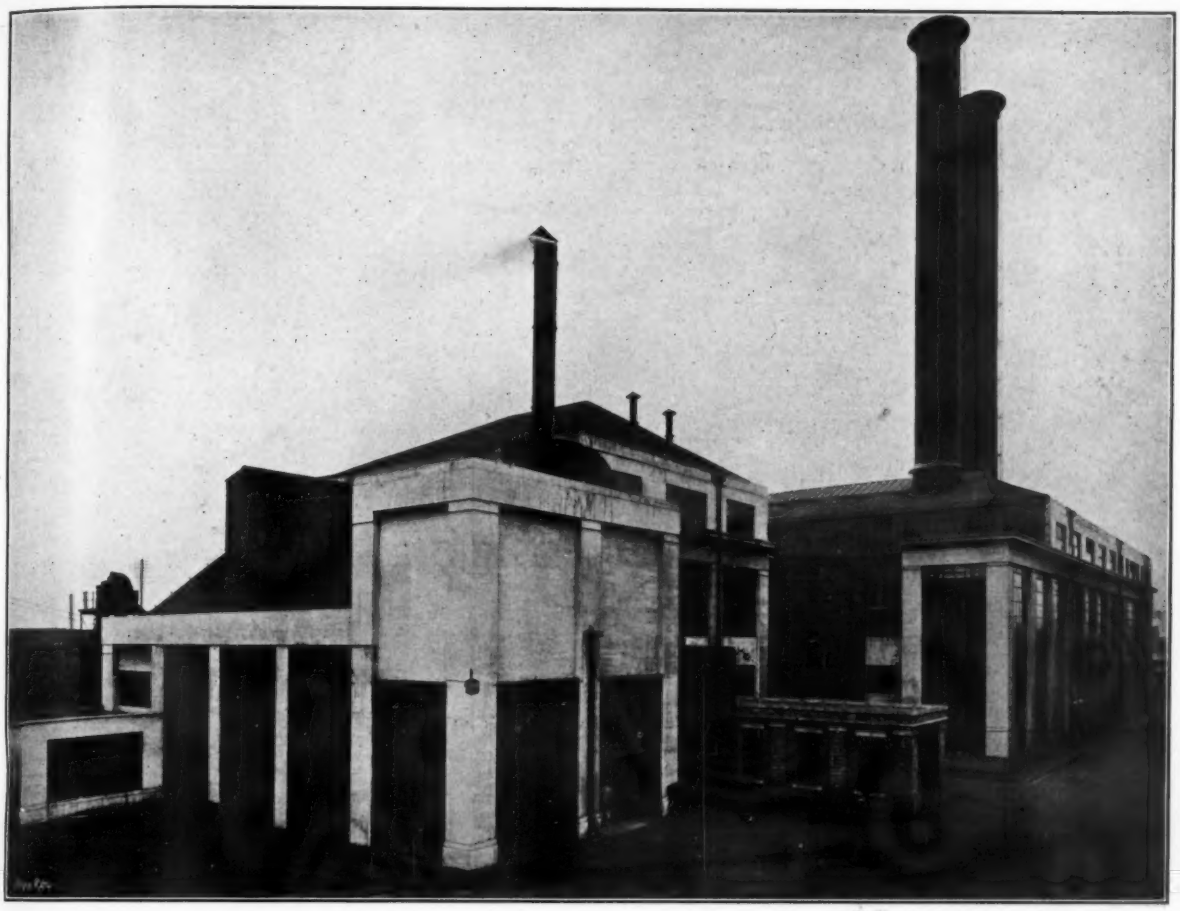


Fig. 4.—External View of Power Station; Pulveriser House on Left.

Fig. 5.—The Turbine and Boiler Sections; No Partition Wall Between Them.

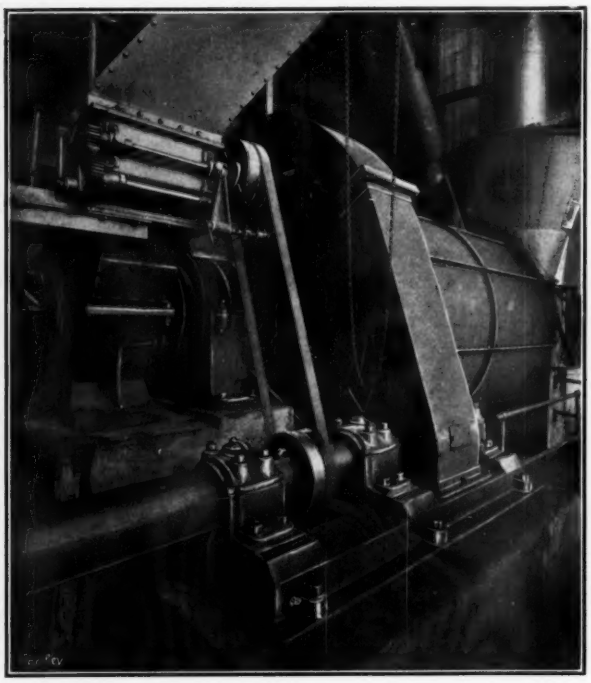


Fig. 6.—Multiple-ball Pulveriser; 12 Tons Per Hour.

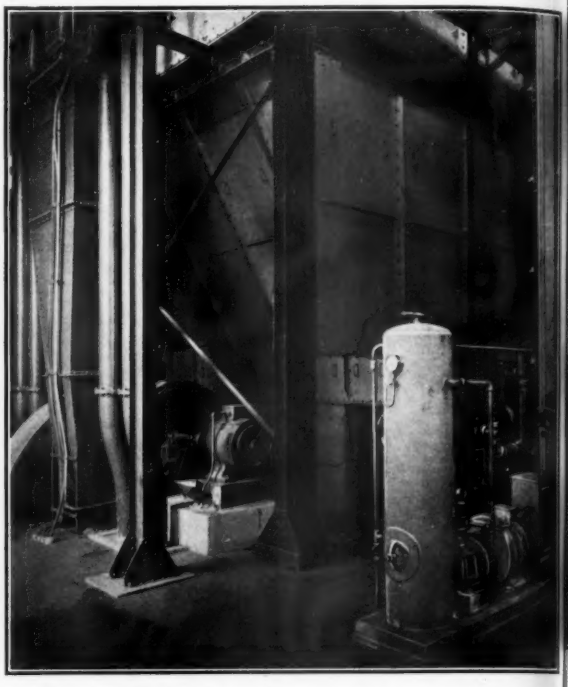


Fig. 7.—Boiler-room Basement; Secondary- and Compressed-air Plant.

Fig. 8.—Rotary Kiln-type Dryer; Combustion Chamber on Left.

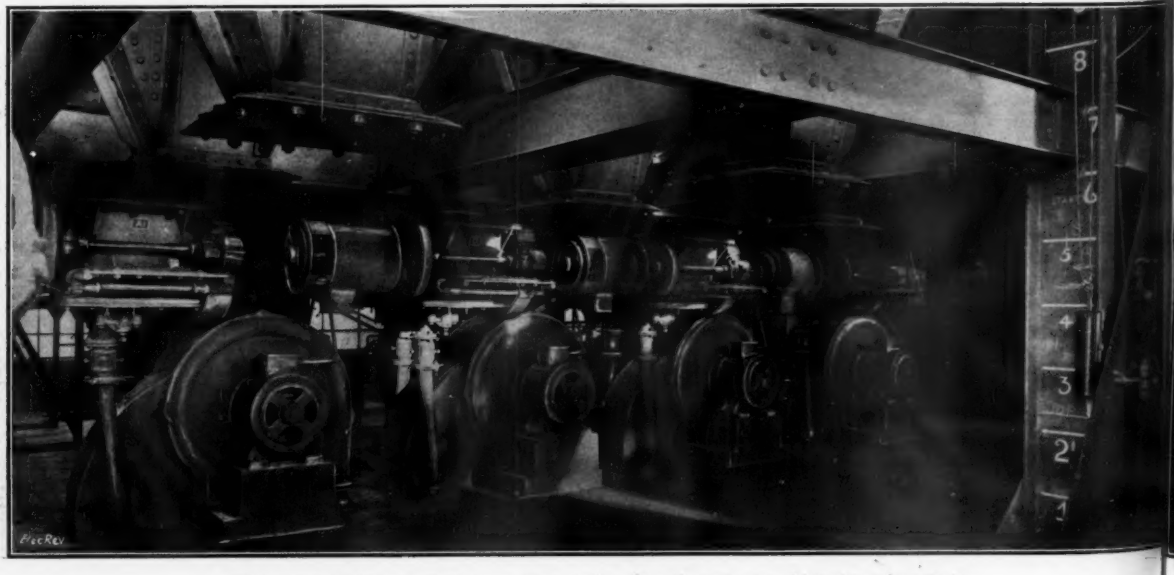


Fig. 9.—Primary-air Fans, Feeders and Bunkers in Pulveriser House.

Fig. 10.—Coal and Air Feeds on Boiler.

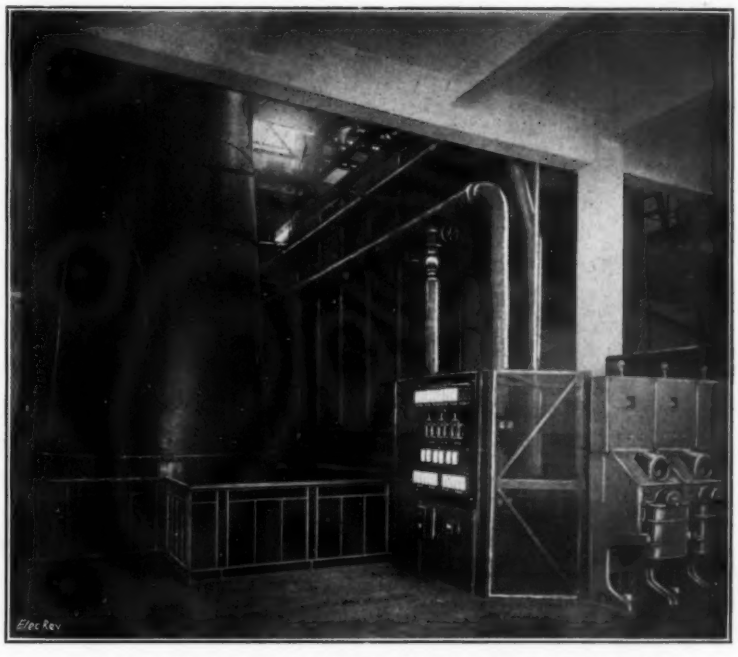


Fig. 11.—Shaft Base and Back of Boilers from Turbine Floor.

Fig. 12.—General View in Boiler Room; Two 75,000-lb. Boilers.

Fig. 13.—Coal-handling Plant; Belt Conveyors.

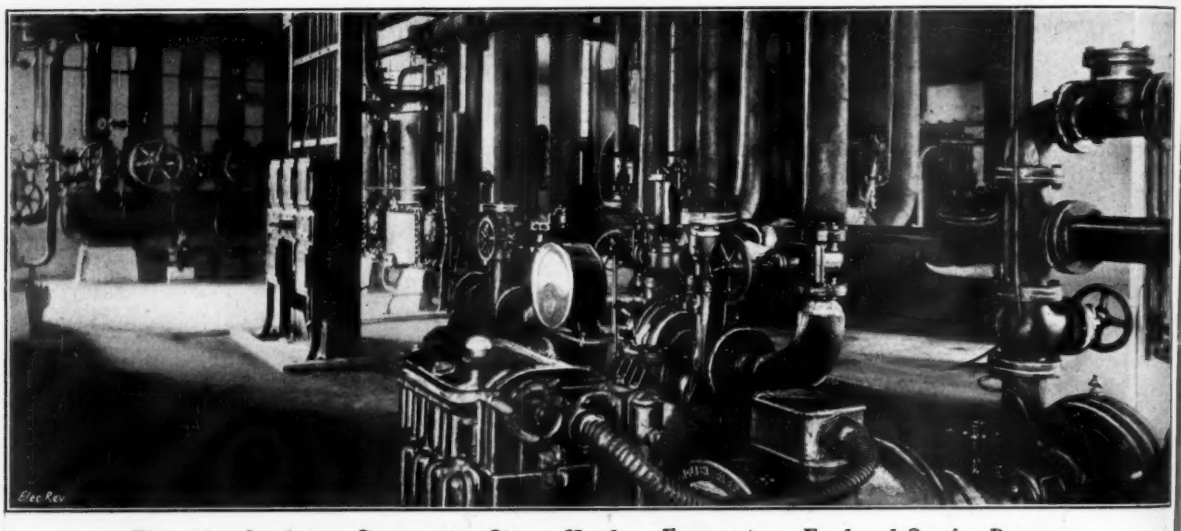
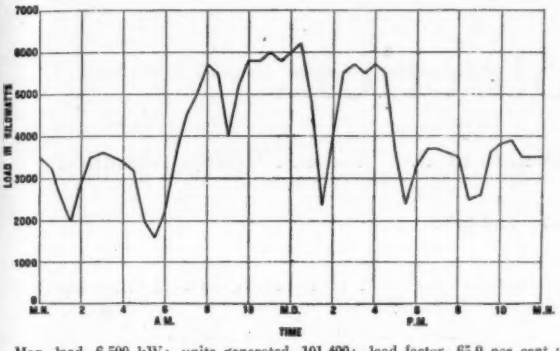


Fig. 14.—Condenser Basement; Steam Header, Evaporators, Feed and Service Pumps.

Fig. 15.—Old and New Stations, showing Ash- and Coal-handling Plants.

In addition to the above a small pocket is formed in the pulverised-fuel bunker to which is attached a small feeder to deliver coal for firing the dryer combustion chamber. The feeder has a capacity of 1,000 lb. per hour and delivers to a primary air fan which blows the coal directly to the dryer combustion chamber. Both feeder and fan are controlled from the dryer house.

Each boiler is equipped with a secondary air fan driven by a constant-speed motor, fig. 7. These fans are situated at ground level and draw air from the culvert which contains, amongst other pipes, the primary air lines. By this means no air is drawn from the boiler



Max. load, 6,500 kW; units generated, 101,400; load factor, 65.0 per cent.; raw coal consumed, 91.9 tons; raw coal consumed per unit generated, 2.032 lb.

Fig. 16.—Recent Daily Load Curve.

house for combustion purposes, so that there is no interference with the ventilating system of the building The secondary air fans deliver through mild-steel trunking, which divides into four branches, each controlled by a damper. The primary air pipes rise vertically from the culvert and enter the secondary air branches just before the burners. The burner nozzles are formed of firebrick, so as to obviate the necessity for using secondary air for cooling purposes on any burner which may be idle. The mixing chamber above the brickwork nozzle is made of cast-iron and is designed so as to give a sharp change of direction from the horizontal to the vertical, thus achieving maximum turbulence in the simplest possible way, without the complication of fixed or movable vanes.

On the front of each boiler there is a control panel, fig. 12, on which are mounted the usual instruments, together with the remote controls for the feeders, primary- and secondary-air fans. A system of coloured lights indicates whether any feeder is working or not, and another series of lights show when each primary air fan has reached its full speed, so as to indicate to the boiler attendant when to start the corresponding coal feeder. All the controls for starting, stopping, and regulating the coal and air are carried out from the boiler panel, in which are also large sight holes for giving the boiler attendant a good view of the interior of the combustion chamber.

Lighting up is achieved by means of a small paraffin burner which is operated by compressed air supplied from a compressor, fig. 7, situated in the basement between the two boilers. A lighting-up aperture is arranged in the front wall vertically below each of the four burners, each aperture being provided with a door having a small circular opening through which the paraffin flame is injected for lighting the pulverised coal. The operation of lighting up is exceedingly simple and reliable. The selected burner is swung into position and a match or taper lights the paraffin flame. The coal supply is started, and ignition of the pulverised coal occurs within a few seconds of pressing the feeder control button. The steam output of the boilers is extremely simple to control, being in this respect on a par with oil firing, which is a great advantage in a power station dealing with a fluctuating load.

The two boilers, fig. 12, with the combustion chambers, were supplied by Messrs. Spearing & Co. Each has a heating surface of 15,000 sq. ft., excluding the superheater. The combustion chamber of each is surrounded by water tubes on all four sides, and has a volume of 5,570 cu. ft. Ash formed during combustion is discharged into a water sluice at the bottom, which conveys it to a whirl pool in the ash-pump house, from which the mixture of ash and water is withdrawn by two 6-in. Blackstone " Unchokable " pumps and discharged *via* an overhead trough across the river into settling ponds. fig. 15. Each boiler is capable of evaporating 75,000 lb of steam per hour, using natural draught only produced by a steel chimney 160 ft. high. The boilers work at an outlet pressure of 260 lb./sq. in. with a superheat temperature of 750 deg. F. Fig. 14 is a view in the condenser basement, showing the steam header, evaporators, service pumps and feed pumps.

The passes through the boiler economiser and chimney are arranged with a view to separating out the fine ash which results from the combustion of the powdered coal, the ash being continuously discharged into a water sluice. No cyclone or grit catcher is used for this purpose, thus saving a considerable expenditure of energy, yet the chimney discharge is remarkably clean, whilst a stream of fine dust is being continuously extracted from the chimney base.

The whole of the pulverised fuel equipment, except the combustion chambers, was installed by Messrs. Simon-Carves, Ltd.

Figs. 1, 2 and 3 show diagrammatically, respectively, the arrangements of the coal-drying plant, the pulverising equipment, and the steam raising plant.

Two generating sets are at present installed, of 12,500 kW and 6,000 kW, respectively, the larger having been supplied by the English Electric Co., Ltd., and the smaller by Peter Brotherhood, Ltd. An " English Electric " alternator is employed in each case, 3,000 r.p.m., 6,600 V, 50 cycles. The condensing plant of the " English Electric " set is designed to maintain a 29¼-in. vacuum with circulating water at 50 deg. F.

The switchgear throughout the station was supplied by the English Electric Co., being of the cell type in the case of the h.p. equipment and of the ironclad style for l.p. The desk-type control board is also of the English Electric Co.'s manufacture.

Perhaps the outstanding feature of the station working is the efficiency obtained, *viz.*, 18 per cent. when

Fig. 17.—A Typical Sub-station.

using low-grade coal of about 9,000 B.th.u. calorific value. Two pounds of coal are user per unit generated, at a cost of 0.157d. per unit. The coal is purchased by the undertaking at 14s. per ton, out of which 9s. 2d. represents freightage costs. The total capital charges for the new station amount to £15.1 per kW.

Distribution is carried out at 6,600 V to sub-stations on the premises of the larger consumers, and to various sub-stations and kiosks on the l.p. supply network. The l.p. distribution is at 400 V, 3-phase (230 V phase to neutral). Some of the old d.c. network still remains, but this is being gradually converted. In some cases motors on the mains are supplied direct at 6,600 V.

Fig. 17 shows a typical sub-station of the undertaking. There are several large power consumers supplied by the undertaking, including the London Brick Works, which has collectively a loading of 3,000 kW, and a silk works which is often loaded at 800 kW. It will also be recalled that a bulk supply is given to Spalding, some 19 miles away. The larger consumers are supplied on a two-part tariff of either £7 per kW plus 0.3d. per unit, or £6 per kW plus 0.4d. per unit. The load factor of the undertaking is about 36 per cent., on a yearly basis.

Fig. 16 shows a recent typical load curve of the undertaking. The domestic load is being pushed by the department, over 1,000 cookers being at present connected to the mains. The domestic rate in vogue is 12½ per cent. of the ratable value of the property, plus £1 service charge and 1d. per unit supplied.

In conclusion, we are indebted to Mr. H. A. Nevill, M.I.E.E., engineer and manager, for his permission to view and take photographs of the plant and to publish the above particulars, and to Mr. T. Rowland, A.M.I.E.E., the deputy engineer, for his assistance in the collection of the information.

Surge Protection.

Some Particulars of the Construction and Operation of the "Ferranti" Surge Absorber.

By E. T. NORRIS, M.I.E.E.

THE most important problem in handling lightning surges is the protection of apparatus. Flashovers of transmission-line insulators may cause some damage to and temporary interruption of the supply, but are not nearly so serious as damage to apparatus, such as transformers. A good protective device should operate effectively when required, and should not interfere at all with normal power-frequency

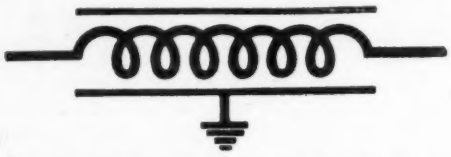


Fig. 1.—Arrangement of Simple Absorber.

operation. These two conditions are hard to meet. It is, in fact, in this respect that most lightning arrestors at present in use are wanting. Surges are, in general, set up whenever sudden changes occur in the electro-magnetic or electro-static conditions, and are due mainly to direct or indirect lightning strokes, and, in a minor degree, to faults and switching operations. The important characteristics of surges are their maximum amplitude, their energy content and their frequency, or, in the case of unidirectional surges, the steepness of wave front.

The amplitude of the surge itself imposes an abnormal stress on the windings, but, owing to the high impulse ratio of transformer insulation, this is not serious and may be taken care of economically in the transformer design. It is well known that a surge entering

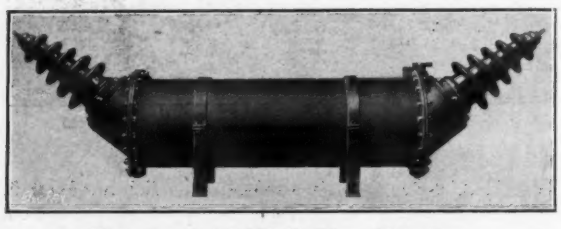


Fig. 2.—A 33,000-V Line Absorber.

a transformer winding does not distribute itself uniformly throughout the winding, but builds up principally on the end turns. The steeper the wave front the greater this concentration of stress. Thus the danger to the winding depends not so much on the amplitude of the surge as on its frequency or steepness of wave front. Moreover, the damage done at different times is cumulative, so that ultimate breakdown of the transformer may not occur for some years, and in the meantime there will be no evidence that the surges are causing damage.

To summarise broadly, the amplitude of a surge causes flashovers of insulators, whilst its steepness of wave front causes breakdown of transformer insulation. An ideal surge arrestor should, therefore, be brought into action both by the amplitude of a surge and by its steepness of wave front—the latter being the more essential. In fact, it may be stated definitely that the principal purpose of arrestors is to protect transformers and other apparatus from internal damage. For comparison purposes protective devices may be divided into two classes, according to whether they operate by discharging the energy of the surge to ground or by absorbing the energy. The former class may be termed the discharge type and the latter class the absorption type.

Fig. 3.—Surge Absorber for 66/220 kV.

Absorption-type arrestors, unlike others, are connected in series with the transmission line, and are intended to protect apparatus on one side against any surge coming from the other side. Since no earth connection is involved there can be no risk of interference with normal power-frequency conditions, and the arrestor may be allowed to operate freely for surges of all kinds.

The Ferranti surge absorber consists essentially of an

air-core inductance connected in series with the transmission line or cable close to the apparatus to be protected. Adjacent to the conductors of the coil, but insulated from them, is a sheet of electricity conducting material, such as steel. This sheet is termed the energy dissipator and is connected to earth. The voltage drop and wattage loss in the absorber at 50 cycles are negligible. In one form of construction the coil is of helical shape, and the energy dissipator is a cylinder surrounding the coil and forming the case of the absorber. This

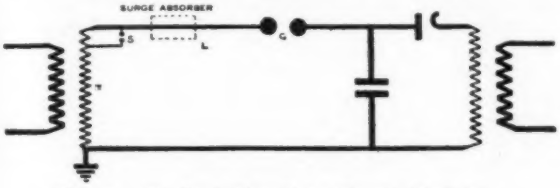


Fig. 4.—Testing Circuit for Surge Absorber.

arrangement is illustrated diagrammatically in fig. 1. A typical absorber for a 33,000-volt line is shown in fig. 2.

In an alternative form of construction the coil, instead of being cylindrical, consists of two or more disk or flat spiral-wound sections contained between two flat sheets of metal forming the energy dissipator. For line voltages of 66 kV up to 220 kV the coil is cylindrical and is mounted horizontally in a similarly shaped tank filled with ordinary transformer oil and provided with bushings at each end. The energy dissipator consists of a metal cylinder arranged inside the coil. The insulation between the dissipator and the coil is similar to that between the primary and secondary windings of a circular-coil concentric winding core-type transformer. Fig. 3 is an illustration of this type of absorber.

The principle of operation of the absorber may be divided into three sections—

(*a*) The inductance coil of the absorber acts as the primary winding of a transformer, the energy dissipator forming a secondary winding of one short-circuited turn. The losses due to the secondary current induced in the dissipator by the surge, together with stray eddy-current losses, are responsible for between 10 per cent. and 30 per cent. of the effectiveness of the absorber.

(*b*) Considering the line winding purely as an inductance, the magnetic field due to the surge current in any part of the winding will set up eddy-current losses in the adjacent metal sheet or dissipator. The surge absorber is so designed that the dissipator is situated in a strong part of the magnetic field of the line winding. Steep wave front surges, such as occur on transmission lines, have equivalent frequencies of 20,000 cycles upwards, and at such frequencies eddy current losses are extremely high. This effect accounts for about 40 per cent. of the action of the absorber.

(*c*) Whenever it is desired to get rid of high-frequency ripples or sudden changes of voltage in a circuit, the ideal arrangement consists of inductances connected in series and shunted by condensers. Such arrangements are used in telephone work and in anode battery eliminators for radio receiving sets.

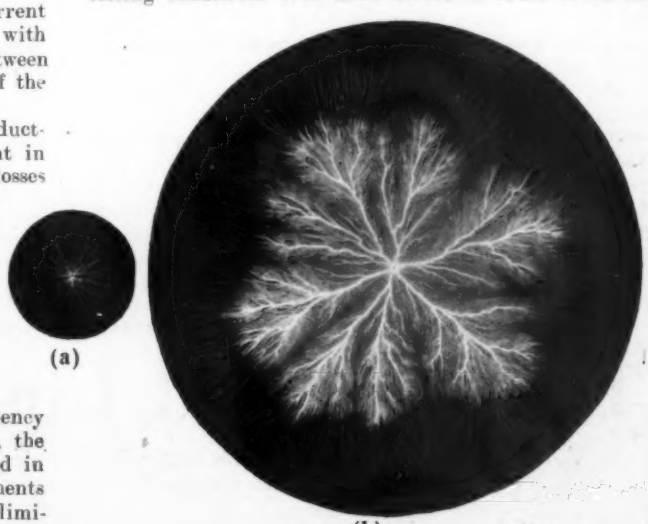
The surge absorber is designed to have a large electrostatic capacity between the coil and the energy dissipator. With the dissipator earthed the capacity so formed acts as a shunt to the series inductance of the coil, and forms the high-frequency or steep-wave-front filter circuit.

The effect of the absorber in reducing the amplitude of a surge, though of minor importance compared with reduction of wave-front steepness, can be deduced from the explanation just given. Sections (*a*) and (*b*) by absorbing and dissipating the energy content of the surge, necessarily reduce both its wave-front steepness and its amplitude. The electrostatic capacity of the surge absorber between the coil and the dissipator is so large that the total energy in the most severe surge is only sufficient to charge it up to a relatively small potential, and the maximum voltage amplitude of the surge will be reduced to this value.

It should be noted that no part of the effectiveness of the surge absorber is dependent upon the inductance of the coil *per se*; in other words, the action of the surge absorber is entirely different from that of an ordinary choke coil. This is evident also from its electrical constants. The effective resistance and capacity of the surge absorber are many times those of an ordinary choke coil having the same inductance.

The successful operation of any form of lightning arrestor is essentially of a negative nature, *i.e.*, its effectiveness is indicated by the absence of any untoward events, such as flashovers or breakdowns. Before positive results can be claimed for any type of arrestor, a large number of arrestor-years, or storm-days, of service will be necessary. In fact, it is probably not exaggeration to say that, at the present time, such positive evidence is not available for any existing arrestor, and that individual opinion usually settles the type of arrestor, if any, installed.

A common method of testing apparatus for its behaviour under surge conditions is by means of a surge of definite wave shape produced by some form of lightning generator. When the Ferranti surge absorber was first constructed, a lightning generator of this type was set up for testing it, and various shapes of wave were tried, both unidirectional and oscillatory. The invariable criticism of any individual wave was that, however effective the test might apparently be, there was no certainty that it represented the worst working conditions as regards both the severity of the surge and the effectiveness of the arrestor. For these reasons the use of this form of lightning generator was abandoned, together with all attempts at producing a surge of given wave shape. Instead of assuming what surge represented the most severe working conditions and then trying to reproduce that surge, it was considered better to reproduce so far as is possible the working conditions themselves, and when any doubt arose, to make the testing conditions even more severe in order to be on



(a) (b)

(*a*) with surge absorber in circuit.
(*b*) without surge absorber.

Fig. 5.—Effect of Surge Absorber; Klydonograph Records.

the safe side. The testing circuit finally adopted is shown in fig. 4. A standard power transformer T energised from a 50-cycle supply is connected to a transmission line L. A tapping is brought out a few turns from the line end of the transformer winding and a small sphere gap S is connected between this tapping and the end winding. The sphere gap S thus measures the concentration of voltage stress on the end turns of the transformer, *i.e.*, the destructive power of the surge.

The surge generator consists of a number of large

condensers charged from a high-voltage transformer through thermionic rectifying valves. The condensers represent the capacity of a length of transmission line. The sphere spark gap G is set for the desired voltage amplitude of the surge. In the first place the surge is sent directly into the power transformer and the resultant voltage stress in the transformer is measured by means of the sphere spark gaps. The surge absorber, or lightning arrestor, to be tested is then connected in circuit between the line and the transformer and the

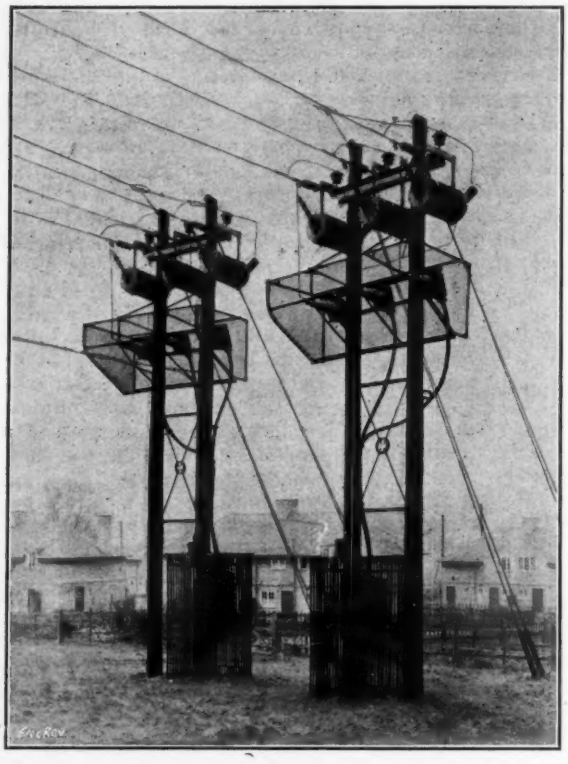


Fig. 6.—Surge Absorbers Installed on 33-kV Transmission Line.

surge test repeated. If the arrestor is effective it will be found that the sphere gap S must be considerably reduced before sparkover takes place. The percentage by which the voltage across the end turns of the transformer is reduced, as measured by the gap S when the arrestor is in circuit, is known as the percentage absorption, and is a measure of the effectiveness of the arrestor.

Values of the percentage absorption measured on a typical Ferranti surge absorber average 85 per cent.; in other words, this absorber reduces the stress on the transformer due to surges to about 15 per cent. of the original value.

A typical aluminium electrolytic arrester has a percentage absorption of 10 per cent. Some of the more modern forms of discharge type arrestor, however, give values as high as 30 per cent. A more impressive visual indication of the effect of the surge absorber is obtained by connecting a Klydonograph, or surge-voltage recorder, across the end turn instead of the sphere spark gap S. Fig. 5 shows typical records obtained in this way of the voltage across the end turns, with and without the surge absorber in circuit. The amplitude of this voltage is approximately proportional to the diameter of the figure. This method of test shows clearly the difference between the surge absorber and an ordinary choke coil. The latter exhibits the well-known characteristics of inductances in causing reflections and in resonating with other parts of the circuit. The percentage absorption of the surge absorber is consistently high for surges of all magnitudes, whereas the percentage absorption of the choke coil varies erratically from small positive to negative values, depending on the type and magnitude of the surge, showing that the coil may even do more harm than good. In developing this method of testing, the main objects were simplicity and the reproduction of the most severe operating conditions.

The present design and construction of the surge absorber is the outcome of six years' continuous research and development work. During that time practical difficulties both in manufacture and in operation have been overcome and the effectiveness of the absorber increased. Although developed within recent years, the Ferranti surge absorber has already been installed in many widely different parts of the world—chiefly in places where lightning storms are exceptionally severe. In some cases Klydonographs, or surge-voltage recorders, have been fitted; in other cases where two transmission lines in parallel follow the same route, the absorbers have been connected in one line only in order to give comparative data. It has been shown that some considerable time is necessary before operating experience can be expected to furnish positive evidence on the effectiveness of the absorber. From the experience obtained thus far, however, there is no instance on record of the absorber failing to give complete protection. With the additional advantages inherent in the absorption type of arrestor, *viz.*, that all difficulties due to attempting to discharge the surge to earth, with consequent power arcs and disturbance to the supply system, are avoided, there is considerable promise that the absorber will provide a solution to the surge protection problem that is simple, safe, and effective under operating conditions.

The Overhead Lines Association.

An account of the summer meeting, which took the form of a tour of inspection of the country distribution system in the Mid-Cheshire district.

EARLY on the morning of July 5th a large contingent of members, with their ladies and guests over 80 in number, of the Overhead Lines Association who participated in the summer meeting travelled from London to Winsford, a few miles beyond Crewe, the starting point of a charabanc tour that had been arranged to exhibit the varied types of overhead lines and features of general interest of the country-area distribution system of the Mid-Cheshire Electricity Supply Co., Ltd. The diverse character of the work done in that district is noteworthy, and the long distances some of the members travelled in order to take part in the meeting is indicative of the interest taken in it. Unfortunately rain fell heavily most of the day, but even that did not damp the enthusiasm of the visitors.

It may be recalled that the supply of electricity commenced in Mid-Cheshire in 1896, when the Northwich Electricity Supply Co. was formed, the power station being operated on Mond gas obtained by a pipe line from the works of Brunner, Mond & Co., Ltd.

In 1912 the Weaverham Electricity Supply Co., Ltd., started operations with a small d.c. suction gas plant, but in the 1914-18 European war period, it became so handicapped that in 1920 the generating station was shut down and the undertaking was leased to the Northwich Co., pending its purchase. In 1924 the latter company obtained from the Electricity Commissioners an Order covering four urban and two rural districts, including four towns, and during the following year Mr. W. Fennell, M.I.E.E., general manager and engineer, formulated a scheme for the whole area of 120 square

miles. Meanwhile the Electricity Commissioners had sanctioned the erection of a 33,000-volt overhead transmission line to enable Crewe and the eastern portion of the North Wales Electricity District to obtain energy from the Mersey Power Co.'s Runcorn steam generating station, and the line was accordingly diverted slightly

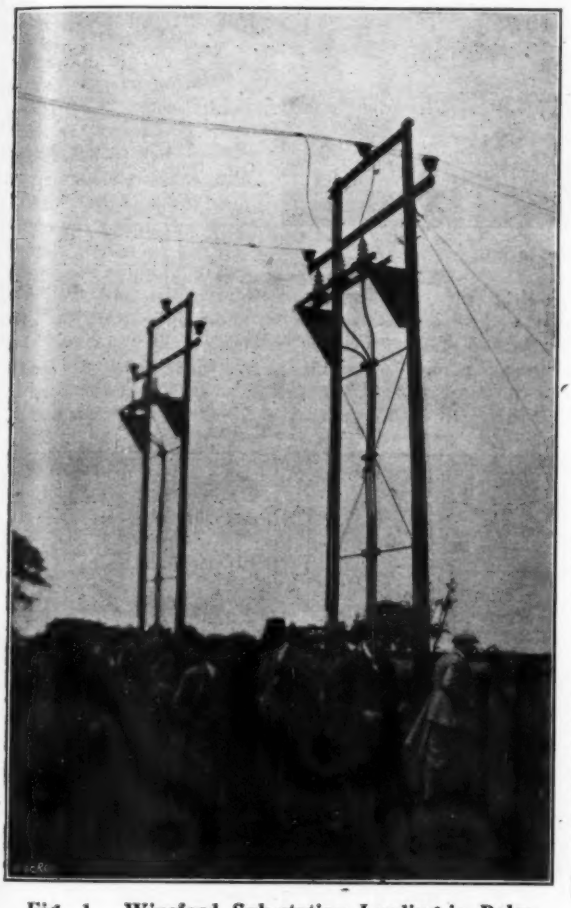


Fig. 1.—Winsford Sub-station Leading-in Poles.

and duplicated in order to provide an adequate supply in bulk for the Mid-Cheshire area. In the interim period it became necessary to purchase 3-phase energy temporarily from the Salt Union's Meadow Bank works, near Winsford, at 600 volts, which pressure was transformed to 33,000 volts to suit the new scheme.

The main bulk supply eventually became available in August, 1926, the Runcorn-Crewe line being tapped at Hartford and Winsford. Those sub-stations are similar, except that the former does not include transformers and switchgear for a local 3,300-V supply. They are really switching and metering points, for primary distribution in Mid-Cheshire is carried out at the transmission pressure of 33 kV, 3-phase, 50 cycles, the system being thus little effected by voltage drops, no matter where any heavy consumer may be connected. The sub-stations are brick-built structures with dividing walls between the h.p. switches and control gear: the duplicate incoming lines are connected by single 33-kV cables, fig 1, to oil-filled drop-down switches having a rupturing capacity of 750,000 kVA; a drop-down metering panel contains duplicate potential transformers, and operation is by lever gear from the adjoining control and meter room. The bus-bars are connected by cables to the Mid-Cheshire bus-bars on the roof of the building, which feed the out-going 33-kV lines through outdoor switches, with air-break isolators on each side, operated by levers from the room below.

The main encircling ring main is carried overhead on A poles, crossing under main roads, railways, and trunk telephone lines in five cases by means of armoured 33-kV cables; h.p. and l.p. lines are carried mostly on wood poles, steel towers being employed in special cases only, and with few exceptions switching and transforming stations are of the outdoor steel-structure and wood-pole patterns, as illustrated from time to time in our pages. The 33-kV ring main is carried across the River Weaver to Barnton, leaving a clearance of 70 ft. for vessels using the waterway, by two steel masts; the phosphor-bronze span is 500 ft. long.

For the d.c. three-wire system in Northwich two 300-kVA, 33,000/6,600-V transformers serve a duplicate circuit, feeding the Lock Street sub-station, which houses Bruce Peebles motor-convertors and "Metrovick" switchgear. In order to cope with subsidence the sub-station is capable of being lifted in one piece, and the machine foundations can also be lifted and levelled independently without putting the plant out of operation. Another rotary sub-station at Witton, a mile away, is fed at 3,300 V by an underground cable; it is at present outside the subsiding brine area. Both rotary stations contain Tudor storage batteries.

On arrival the visiting party inspected the switching station at Winsford; then proceeding down Station Road, which is on a subsiding hillside, a ¼-mile span wood-pole river crossing was seen before passing a "lifting-type" church (one of many such buildings in the salt area) and a small showroom of the Company; in Winsford underground mains are laid. At the extreme end of the suburb of Over a steel-pole, single-phase, 640-ft. span rural line was noticed in course of erection, with 3,300-volt copper-steel conductors, which design is claimed to be a possible solution of the rural distribution problem at low cost. The beautiful Whitegate region is one of the several country districts that have been developed on the single-phase 3.3-kV system, and attention was called to the special arrangement of the conductors with a patent guard bridging the earthed return and the earth wire. These lines consist of four wires: below the single h.p. conductor are the l.p. conductor, the earthed return and the earth wire, four earthing plates being provided per section, with pole-mounted transformers and fuses. They are compounded in sections not longer than ¼ mile each, without contravention of the earthing regulations, economy resulting from the carriage of both the h.p. and l.p. wires on one set of poles.

Figs. 2, 3 and 4.—Members Assembling for Charabancs.

Several farms are supplied in this area and also the typical Cheshire Hall of Heyesmere, near Sandiway Bank where the Northwich-Chester Road (Watling Street) was reached. Passing the late Sir John Brunner's resi-

dence, the golf course and round tower, a short halt was made at the Blue Cap Hotel for refreshment, there having been no time to obtain luncheon. Then Kennel Wood was entered to watch spruce timber being treated by the "Cobra" process of preservation, the application of which is simple. A fungicide in paste form is injected in the butt of the pole through a hollow needle which is driven into the timber. The machine is designed on the grease-gun principle, the paste dissolving and spreading through the timber cells by capillary action and osmosis.

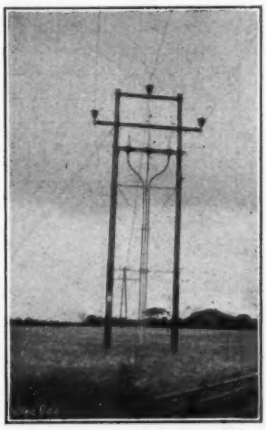
Figs. 5 and 6.—At the Winsford Sub-station.

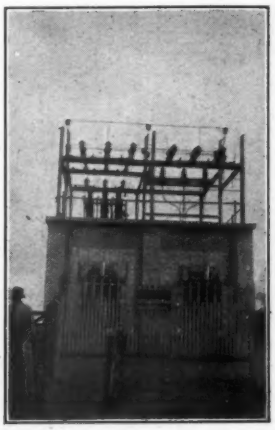
Proceeding along the Chester Road through part of the old Delamere Forest area, a short halt was made at Hatchmere to visit the Jewish Children's Fresh Air Home, an exceedingly well-laid-out and equipped institution. At the village of Norley more compound lines and 3,300/220-volt guarding were noted (avoiding pole duplication and permitting heavy consuming devices to be connected); also an inconspicuous overhead service entry to the church, and cheap crossings over Post Office lines in the form of p.b.j. "Pernax" insulation for 3,300 volts.

The Delamere House estate, Ruloe, is an example of rural development in beautiful surroundings, and at Upper Cuddington all the farms and cottages have been wired for the tenants by the owner, Major Wilbraham. The route continued through Owley Wood village and Brunner, Mond & Co.'s housing estate, all the 250 houses on which are served electrically by a single-phase underground cable network developed in three circuits and fed from a small sub-station. Down the Weaver Valley views were obtained of the Northwich sub-station and heavy 3-circuit line, stepping down from 33 to 6.6 and 3.3 kV, and Brunner, Mond & Co.'s new works extension.

At this stage time and bad weather necessitated part of the route being short circuited, the visitors taking refuge in "Electricity House," the company's headquarters in Northwich adjoining the electrically-operated town swing bridge. After viewing the well-appointed showrooms and Peebles motor-convertor sub-station, a short ride brought the party to Waverley Cottage, where high tea was served in a large marquee erected on the presidential lawn. During the meal Mr. W. Fennell, who occupied the chair, and the company were thanked for their hospitality and for facilitating the tour. Just before the departure, *via* Winsford and Crewe, by train from London a burst of evening sunshine permitted of a group photograph (fig. 11) of the party being taken on the lawn.

Figs. 7 and 8.—The Arrival; inspecting Steel Tower.





Figs. 9 and 10.—A 33-kV Switching Station and Line.

The Metropolitan-Vickers Electrical Co., Ltd., invited O.L.A. members to visit its high-voltage laboratory and new West Works, reference to which is made elsewhere in this issue, on the Saturday morning following the tour.

Fig. 11.—Assembling for Official Photograph on President's Lawn.

The E.H.P. Conference at Paris.

A Review of the Proceedings.

By R. BORLASE MATTHEWS, Wh.Ex., A.M.Inst.C.E., M.I.E.E., F.R.Ae.S.

(*Continued from page* 17.)

THE subject of the second section of the Conference was certainly much more closely allied to the avowed scope of the Conference than was that of the first section.

Line Construction and Insulation.

The papers in this Section were grouped in five parts, and each of the parts was summarised and commented upon by a special reporter. Mr. C. Duval (France) acted as chief reporter, while the following gentlemen dealt with the specific subjects following their names:—C. Busila (Rumania)—lines; W. Borgquist (Sweden)—supports; M. Henriod (U.S.A.)—insulators; Van Staveren (Netherlands)—conductors; and J. Hielmann (France)—lightning. Professor V. List (Czecho-Slovakia) was the chairman of the first portion of the meeting and was followed in the chair by Mr. C. E. Montañés (Spain).

The paper by Mr. J. R. Beard on the Central Electricity Board's "grid" is well worth reading, as it contains a number of interesting details that have hitherto not been disclosed. Pilot-wire protection has been employed for line sections of 12 miles, or under, while impedance protection has been employed for longer lines. On some of the 33-kV lines reinforced-concrete poles of the hollow centrifugal type are to be installed. Some very interesting lantern slides were displayed, particularly of the large 75,000-kVA transformers and methods of handling them on rail. Major T. Rich commented upon the politics of the "grid"; however, the chairman pointed out that the Conference could only interest itself in technical matters. Mr. V. Ferranti contributed to the discussion, pointing out some of the difficulties in design owing to the restricted loading gauge of British railways, compared with those of other countries. The 132-kV transformer windings are star-connected and the neutral point is earthed, which simplifies the voltage-regulating equipment and enables the size of the transformer to be appreciably reduced. It also saves £500,000 on the whole "grid" scheme. Messrs. W. B. Woodhouse and E. B. Wedmore gave an account of the work of the British Electrical and Allied Industries Research Association on overhead lines. The contents of this paper are similar to those of the paper read before the I.E.E. in November, 1928.

Now and then exceptionally long spans have to be negotiated. In this connection the description of two spans of 4,300 and 3,900 ft., respectively, by Mr. R. Favier was of interest. They were constructed for the Société des Forces Motrices du Vercours and have a capacity of 10,000 kW at 60,000 volts. It was stated that no particular difficulties were encountered in the design of the fastenings, supports and foundations; the only real trouble was the calculation and installation of the lines. Details of both the latter points were given. A telpher ropeway was employed for the erection. Four lines, spaced 25 ft. apart, are employed; one is connected to earth, but can be disconnected for use as a conductor should one of the other conductors fail. Steel-aluminium cables are employed with an elastic limit of four tons, and an ultimate strength of seven tons. It seems that the modern cable, *inter alia*, has to be aeroplane collision-proof; hence, due allowance for this possibility was made in the strength calculations.

Mr. P. Ferrier, in his paper on portable temporary overhead lines, drew attention to modern requirements for electric ploughing, &c. The trestle-supported steel lines employed weigh about one and a quarter tons per mile, the latter being the practical limit of transmission. The lines are sectionalised into quarter-mile lengths. Mr. P. van Halteren submitted a note on the maintenance methods employed in Belgium. No work is done on the lattice steel poles during fog, rain, or storm. Painting is carried out up to the lower cross-arms without any special precautions. Above that level the lines are earthed at *both* ends, before any work is done, by the foreman responsible for the work. To ensure safety, he has to motor to both ends to do the earthing personally.

Mr. C. Mateescu critically examined the proposals made at the last session of the Conference for an international basis for overhead-line calculations, and arrived at the conclusion that a single formula could be applied for all countries by using a single variable parameter. This paper should serve as a basis for the consideration of the modification of British regulations.

Anyone with a taste for higher mathematics should find much of interest in the paper by Mr. G. Silva, where he applies the catenary formulæ to the mechanical study of overhead lines.

The papers on wood structures for line supports aroused considerable discussion. With a view to using home materials and the difficulty in obtaining prompt and cheap deliveries of steel lattice poles, Mr. K. Stroemberg described 50,000- and 70,000-volt lines erected in Finland, which included 50-feet-high towers. Many rural electrification schemes are held up owing to the high cost of the distribution lines. A new form of sawn-timber support, suitable for lines at pressures up to 6,600 volts, was described by Mr. R. Borlase Matthews. It was claimed that this type of line could be erected for under £70 per mile (excluding only the conductors). This economy is due to the use of two pieces of ordinary sawn timber bolted together, thus forming a letter "X."* At every quarter of a mile stouter anchor posts are erected. The poles are mounted clear of the ground on two-foot lengths of iron piping set in concrete blocks, which serve as footings; thus rotting at ground level is obviated. Two men can easily erect this type of line, as it is so light, also the cost of transport is low, while the timber employed is a commercial, cheap article easily obtainable anywhere. The author described, during the discussion, an improved cylindrical concrete block which could be placed in an augur hole in the ground, the steel pipe being set in it at a suitable inclination to take the leg of the pole. Mr. W. Borgquist stated that he considered the design to be most ingenious and cheap; however, its main faults were the larger piece of ground required and the inherent fault of sawn timber in that it was liable to crack.

In considering steel supports, chief interest turned on the painting. Mr. C. A. Orséro read a very thoughtful detailed paper on the subject. Incidentally, reference was made of paints in which lamellar oxides of volcanic origin are employed; these paints have great covering and lasting power.

Mr. P. Ferrier dealt with the influence of the flexibility of supports upon the mechanical security of the cables, pointing out the longer life obtainable and more freedom

* See ELECTRICAL REVIEW, July 13th, 1928, pp. 54-55.

from breakage, where the poles were flexible to a certain degree. The difficulty of twisting on the breakage of one wire is, of course, one of the main disadvantages of a flexible system of construction. Up to the present a good many designers and operators have looked upon the problem of torsion on towers as an extremely complicated one. However, by the aid of a mathematical investigation, coupled with experimental work, Messrs. G. Sulzberger and B. Jobin claim to have solved the matter and have recorded their results in a paper.

(To be continued.)

Parliamentary News.

[By Our Special Parliamentary Reporter.]

The King's Speech.

Parliament was opened by Royal Commission on Tuesday, July 2nd. The King's Speech, read by the Lord Chancellor, contained many references to the relief of unemployment, foreshadowing schemes for the improvement of transport, the stimulation of the depressed export trades, the economic development of the Empire, and for the reorganisation of the coal industry. A Factory Bill will also be introduced, and the Washington Eight-Hours' Convention will be ratified. There will also be inquiries into the state of various industries, including iron and steel.

During the debate on the Address, Mr. J. H. THOMAS, who, as Lord Privy Seal, is co-ordinating the Government's plans for the relief of unemployment, indicated that an agreement had been reached whereby work on Waterloo Bridge could be begun at once, and the new Charing Cross Bridge would follow later. He had indicated to the railway companies, as schemes that ought to be proceeded with, the electrification of Liverpool Street, the extension of the Finsbury Park tube, and the construction of a new goods tube railway round London.

The Channel Tunnel.

On July 4th, Mr. J. H. THOMAS, Lord Privy Seal, stated, in reply to questions, that the Channel Tunnel investigations involved an examination of a large number of geological, engineering, economic, and other technical problems. He had taken an immediate opportunity to consult the Chairman of the Committee to ascertain the position and to urge an acceleration of the inquiry having regard to its possible bearing on unemployment. The inquiry was well advanced, and the Committee hoped to submit a report before the end of the year. There would be no delay on the part of the Government in considering that report.

Way-leave Agreements.

On July 4th, Brigadier-General CLIFTON BROWN asked the Minister of Transport whether the Electricity Commissioners had yet arranged a standard form of way-leave agreement or whether they were still considering a draft form of agreement with interested bodies, and, if so, what were the associations which they were consulting.

Mr. HERBERT MORRISON said that the Electricity Commissioners had been for some time past, and still were, in communication with the Law Society with a view to the provisional settlement of a draft of a proposed standard form of wayleave agreement, and they proposed to submit the draft when provisionally settled for the consideration of representative associations of the electricity supply industry, of landowners and farmers, and other interested parties.

A Welsh Scheme.

On July 4th, Mr. HOPKIN asked whether any scheme for the supply of electricity had been drawn up for the area including Carmarthenshire; and, if so, when the scheme was expected to be completed.

Mr. H. MORRISON said that an electricity scheme for South-West England and South Wales, including Carmarthenshire, was at present being prepared by the Electricity Commissioners. The Commissioners expected that the scheme would be ready for transmission to the Central Electricity Board before the end of the current year.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The New Secretary of the D.O.T.

It was announced on Monday last that the King had approved the appointment of Mr. George Masterman Gillett, M.P., as Secretary of the Department of Overseas Trade. Mr. Gillett is the Labour member for Finsbury, and is a banker by profession.

The Co-ordination of London Transport.

It was announced last week that the Minister of Transport (Mr. Herbert Morrison) had interviewed representatives of the London County Council and the "Underground" Group with reference to those bodies' Bills providing for the common management of London's tramway, omnibus and underground railway services. The Minister intimated that he could not advise Parliament to proceed with the Bills. The Government, however, was fully alive to the importance and urgency of the problem of London traffic and was ready to explore it further at once with the interests concerned.

According to *The Times*, Sir William Ray, leader of the Municipal Reform party in the L.C.C., states that the Council will go on with its Bill. "The responsibility for killing the Bills and incidentally preventing a great deal of employment must rest with the Government. If the Bills are not allowed to pass, then the Government must put forward its alternative proposals, as the matter is one of the utmost urgency."

Unemployment.

The Ministry of Labour returns showed a decrease of 4,913 in the number of registered unemployed during the week ended June 24th. At that date the total was 1,117,800, as compared with 1,122,713 on June 17th, and 1,192,564 on June 25th, 1928.

Increased Dutch Exports.

The Commercial Secretary to the British Legation at The Hague states that, according to the *Algemeen Handelsblad*, it is reported that the total export from Holland of wireless articles during 1928 has already been exceeded by about nine million florins during the first five months of 1929, which proves the enormous extension which this industry has undergone. The export of electric lamps also shows an increase on the first five months of 1928 the figures being: 1928, fl. 10.14 millions; and 1929, fl. 12.83 millions.

United States Electrical Exports.

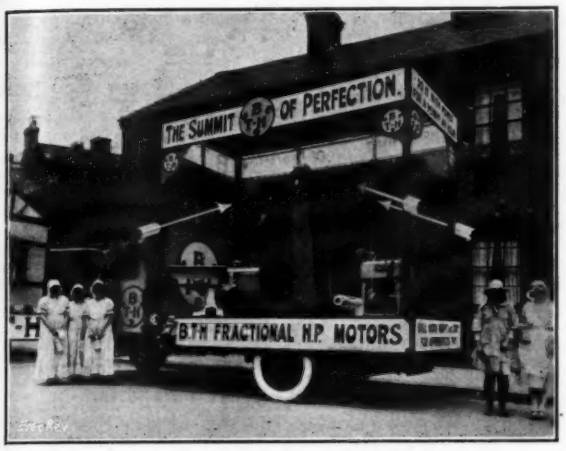
The official returns of the United States electrical export trade during April last show a total value of $12,221,805 (against $8,605,820 in April, 1928). Electrical refrigeration sets, up to 1-ton capacity, again headed the list, the value of $1,365,492 being almost double that shown for the preceding April. During the first four months of the year the value of exports of this class has risen from $1,673,884 to $3,992,458. Other notable increases in the list were the following:—Radio apparatus, from $711,984 to $999,348; motors, 1 to 200 h.p., from $219,144 to $417,561; controlling apparatus for industrial motors, from $116,485 to $197,758; insulated copper wires and cables, from $275,982 to $468,881; telephone apparatus, from $218,045 to $527,504; and household washing machines, from $138,300 to $233,075. The only important decreases were the following:—Converting machinery, from $166,438 to $63,972; switchboard panels, from $264,349 to $84,665; and metal-filament lamps, from $154,768 to $93,176. The exports to the United Kingdom were valued at $1,082,304 and consisted largely of fractional h.p. motors, portable electric tools, accessories and parts for motors, washing machines, vacuum cleaners and other motor-driven household devices, insulated

copper wire and cable, and refrigerators. Canada, as usual, was the principal customer, taking goods valued at $3,346,458. After the United Kingdom the next in order were:—Argentina $782,266, Brazil $676,563, Australia $669,971, and Cuba $407,876.

The imports of electrical goods and apparatus into the United States during April were valued at only $184,642.

B.T.-H. Tableaux in Coventry Carnival.

At the "Lady Godiva Procession and Pageant" on June 29th, with which was incorporated the Coventry Hospital Carnival, the BRITISH THOMSON-HOUSTON CO., LTD., had a number of exhibits in the long and interesting procession. One of the awards secured by the company was the first prize in the horse-drawn tradesmen's exhibits section, the exhibit



A B.T.-H. Tableau at Coventry.

being a full size model of the "Golden Arrow" car with which Sir Henry Segrave set up a world speed record; B.T.H. magnetos were fitted to the "Napier-Lion" engine. The actual wheels and disks used on the car were incorporated. The waggon, which was 30 ft. long, was drawn by five horses, making the length of the unit 100 ft.—the longest and also the highest, in the procession. Another attractive exhibit by the British Thomson-Houston Co., Ltd. (depicted herewith) effectively illustrated the range of B.T.H. fractional horse-power motors and some of their many applications in industry and the home, including the driving of motor-tire pumps, washing and ironing machines, &c. B.T.H. magnetos and fractional horse-power motors are manufactured in the company's Coventry factories.

Book Notices.

"The Henley Telegraph," June, 1929. London: W. T. Henley's Telegraph Works Co., Ltd. Price 6d. net.—This number commences the fourth volume and maintains the high standard which the journal has reached. Of particular interest is the history of the origin of the company and the strenuous labours and misfortunes of Mr. W. T. Henley.

"B.I. Wire Tables." Pp. 28. Prescot: British Insulated Cables, Ltd. Price 5s.—This booklet includes tables for single copper wires, stranded annealed conductors, stranded hard-drawn conductors, aluminium conductors, flexible cords and cables. A useful addition is a calculator for finding the voltage drop and cable size in two-wire and 3-phase circuits.

The B.B.C. has issued a programme and syllabus of broadcasts to schools. The programme covers the period September, 1929, to June, 1930, while the syllabus extends over the school term from September 23rd to December 13th, 1929. The pamphlet is the first to be issued under the auspices of the new Central Council for School Broadcasting. A foreword explains exactly the powers and duties of the new Council, the membership of which is set out in full in an aprendix.

"Electromagnetic Problems in Electrical Engineering," by B. Hague. Pp. xiv+359; figs. 116. London: Humphrey Milford, Oxford University Press. Price 30s. net.

"Arc Welding," by E. P. Hulse. Pp. ix+421; illustrated. London: McGraw-Hill Publishing Co., Ltd. Price 25s. net.

"Engineering Electricity," by R. G. Hudson. Second edition. Pp. viii+214; figs. 209. London: Chapman & Hall, Ltd. Price 12s. 6d. net.

New Municipal Showrooms.

A new electrical showroom in Carlton Street, St. Helens, was opened on June 26th by the Mayor, Alderman T. H. Boscow. The showrooms are equipped with the latest domestic appliances and fittings.

Recent Contracts.

Three electric transporter cranes, two of which have a lifting capacity of two tons, and the third a capacity of five tons, have been installed by the Burns Laird Line at its Belfast departure berth, Broomielaw. The cranes were built by ALEXANDER CHAPLIN & Co., Govan.

The English Electric Co., Ltd., has received an order from the Maidstone Corporation for seven six-wheel, double-deck, top-covered trolley omnibuses, each vehicle having seating accommodation for 56 passengers. The equipment will consist of an 80-h.p. motor with standard camshaft foot-operated controller. The complete vehicles will be built at the company's Preston works.

Registered Electrical Contractors.

Applications for registration from the following were accepted by the Executive Committee of the National Register of Electrical Installation Contractors at its last meeting:—

Hough Electric Motor Co., Ltd., Rochdale.
Sheath, N. J., Edgbaston, Birmingham.
North Electrical Co. (1929), Ltd., Leeds.
Pock, A., Leeds.
Donkin, N. H., Leeds.
Dickinson, F., Leeds.
Prior, H., Leeds.
Huggard, S., & Son, Leeds.
Ramsden, S., Leeds.
Marsden, W., Leeds.
Whitaker, J. W., Leeds.
Westfield Electrical Co., Leeds.
Bedford, J. E., & Son, Leeds.
Smith, F., Leeds.
Phillips & Sons, Leeds.
Raper, H., Hull.
Pearson, G. E., Leeds.
Mohan, E., Hull.
Pepper, S., Stockport.
Contractors (Stanningley), Ltd., Pudsey, nr. Leeds.
Clark & Wilson, Carlisle.
Thompson, George (Leeds), Ltd.
Rigby, T., Leeds.
Good Bros., Liverpool.
Mortlock, C., Ltd., Penge, S.E.20.
Vanstone, C. P., Bath.
Hellaby, W. T., & Co., Ltd., Birmingham.
Pickup, W., Blackburn.
Ward, H. F., Hall Green, Birmingham.
Thacker, E. J., Handsworth, Birmingham.
Brooke, J. E., Harrogate.
Barkers Electric Service, Gateshead.
Guthrie, J. M., Stockton-on-Tees.
Central Electrical Co., Birmingham.
Braine & Parris, Eastbourne.
Hodgetts & Le Maistre, Jersey.
Cannock Urban District Council Electricity Department.

At the same meeting two applications were withdrawn and nine were declined.

The "Magicoal" Houseboat.

In our notes on the recent I.M.E.A. Convention at Torquay we made reference to the novel houseboat which was to be seen lying off the coast. We have now received from BERRY'S ELECTRIC (1928), LTD., a view of the main cabin of the boat,

The Cabin of the "Magicoal" Houseboat.

which is reproduced herewith. It appears to be well equipped with electric heating, there being numerous examples of "Magicoal" fires of all patterns.

The New "Merger" Building.

Sir Herbert Baker, A.R.A., F.R.I.B.A., has undertaken the design of the Victoria Embankment elevations of the new head office of Cables and Wireless, Ltd., and Imperial and International Communications, Ltd. The building is to be erected on the site of the old L.C.C. Education Offices, adjoining the Temple Station. The plans are being prepared by Messrs. Grace & Farmer, F. & L.R.I.B.A., in conjunction with Mr. J. Norman Rhodes, F.S.I., surveyor to the cable companies.

E

Changes of Address.

The offices of the Plymouth City Electrical Engineer (Mr. E. G. Okell) have been transferred to Armada Street, Plymouth.

The secretarial office (including accountant's and transfer offices) of the North Metropolitan Electric Power Supply Co. has been removed to Northmet House, Cannon Hill, Southgate, N.14. (Telephone: Palmers Green 4001.)

New Philips Showrooms.

The illustration accompanying this note depicts a part of the new showroom which Philips Lamps, Ltd., has opened at its Charing Cross Road premises. The showroom has been

A New Philips Showroom.

arranged for the demonstration of the company's radio apparatus, electric lamps and lighting fittings to dealers and customers.

New Catalogues and Lists.

English Electric Co., Ltd., Queen's House, Kingsway, W.C.—Publication No. 947, illustrating and describing oil-immersed circuit breakers, class OKD 1, for outdoor use on circuits up to 33,000 V. Also a leaflet containing a map showing the principal streets, hotels, theatres, &c., in Bradford, and how to get to the company's works from the two railway stations.

Messrs. Evershed & Vignoles, Ltd., Acton Lane Works, Chiswick, W.—Catalogue No. 163a, dealing with the "Megger" earth tester, including methods of testing and a description of the machine.

Jackson Electric Stove Co., Ltd., 143, Sloane Street, S.W.—An illustrated and priced folder advertising the Jackson "Junior" electric cooker.

Paragon Electrical Co., 137, Victoria Street, S.W.—A leaflet describing the "Paragon" earth bottle. Illustrated and priced.

Hart Accumulator Co., Ltd., Marshgate Lane, Stratford, E.—A folder containing useful battery information for electric lighting contractors interested more particularly in private electric lighting installations. The folder deals with batteries for plants from ½ kW to 6¼ kW.

Messrs. W. Canning & Co., Ltd., 133 to 137, Great Hampton Street, Birmingham.—Two publications drawing attention to chrome plating plant and outlining its many applications. Illustrated.

Messrs. Wolf & Morgan, Ltd., 66, Victoria Street, S.W.1. —An illustrated pamphlet showing the type "RAR" Wagner rubber-mounted motor.

Electric Heating Co., George Street, Croydon.—A leaflet illustrating the "Utility" frame for electric cooking.

United Strip and Bar Mills, Ltd., The Ickles, Sheffield.—A handy pocket-size booklet setting out the various sections of steel strip and bar of their manufacture; many useful tables are also incorporated.

Heyes & Co., Ltd., Water Heyes Electrical Works, Wigan. —An illustrated pamphlet drawing attention to the "Wigan" flameproof and watertight unit type distribution panels.

British Brown-Boveri, Ltd., Trafalgar House, Waterloo Place, S.W.—A list of 122 installations which have been completed, or are on order, for high power rectifiers to operate at d.c. pressures exceeding 1,000 V.

Mersey Cable Works, Ltd.—Linacre Lane, Bootle, Liverpool.—A new price list of the company's cables.

Cable Research in Germany.

The majority of the electric wire and cable manufacturers in Germany, including the principal concerns, have lately joined together in forming the Technische Arbeitgemeinschaft der Deutschen Kabelindustrie ("T.A.K."). The object of the new body is to carrying on research work on wires and cables for electrical purposes of all kinds to the common advantage of all engaged in the industry. Dr. R. Apt, of Berlin, has been appointed director of the new association.

Trade Announcements.

Messrs. T. W. Broadbent, Ltd., Victoria Electrical Works, Huddersfield, are opening additional premises at 18, Chapel Hill, Huddersfield, as showrooms for electric lighting fittings, domestic appliances and wireless apparatus. They ask for up-to-date catalogues from the trade.

The United Electrical Co. (Birmingham), Ltd., has removed to a new and larger factory, in Penn Street, Birmingham, where "Collex" switchgear and fuseboards are being manufactured. The new telephone number is Aston Cross 3467.

Mr. J. Duncanson, A.M.I.Mech.E., A.M.I.E.E., 29, Waterloo Street, Glasgow, has been appointed sole representative for Scotland for Messrs. Alfred Graham & Co., Ltd., and the Artic Fuse & Electrical Manufacturing Co., Ltd. Mr. Duncanson will continue to represent Messrs. Caldwell & Co., Glasgow.

The Bastian Meter Co., Ltd., has arranged to erect a 300-kW Mascarini electro steam boiler at its Farnham Road Works, Slough. This will be demonstrated to interested visitors.

The "Safeguarding" of Mercury-vapour Rectifiers.

The *Board of Trade Journal* announces that representations have been made to the Board under Section 10 (5) of the Finance Act, 1926, regarding, *inter alia*, mercury vapour rectifiers. The section in question provides that the Treasury may exempt any article from the duty imposed by Section 1 of the Safeguarding of Industries Act, for any period, if a consumer of the article can satisfy the Board of Trade that the article is not made in sufficient quantities, or that there is no reasonable probability of its being produced in sufficient quantities within a reasonable period, in any part of the British Dominions. Any communications upon the matter should be addressed to the Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade, Great George Street, S.W.1, within one month from July 3rd.

New Zealand's Electrical Imports.

During the first quarter of the current year New Zealand imported electrical equipment valued at £489,193. Of this the United Kingdom was responsible for £261,251, the United States for £112,144, Canada for £40,712, and Australia for £8,799. In the corresponding period of last year the total was £542,166, contributed as follows: United Kingdom, £300,617; United States, £115,861; Canada, £33,881; and Australia, £10,072.

All-Electric Houses at Croydon.

In a few cases municipal authorities owning electricity undertakings have embarked upon the provision of all-electric houses with the object of cultivating the use of electricity. Private builders are now paying attention to the possibilities of such houses. At a new estate off Selsdon Road, South Croydon, all-electric houses are being erected and they sell immediately.

All-Electric Houses at Croydon.

Such houses are easily recognisable by reason of the absence of chimneys, though as a matter of fact each place has a small chimney to permit the use of a coke stove in the scullery. The houses have been built by Mr. George Peskett, of South Croydon.

Municipalities and an American Purchase.

The municipal authorities of Smethwick and Oldbury have made a protest against the proposed purchase of the Shropshire, Worcestershire and Staffordshire Electric Power Co. by the Greater London and Counties Trust, Ltd., on behalf of the Utilities Power and Light Corporation of Chicago. They state that the amount offered is considerably in excess of the intrinsic value of the company's assets, and therefore militates against the lowering of the charges for electricity. They maintain that if further capital is required for the development of the electricity supply industry it could be raised in this country, without recourse to Chicago, "by methods consonant with prudent finance."

Bankruptcy Proceedings.

J. A. HENDERSON, electrical contractor, trading as "Hendersons" at 28a, Basinghall Street, E.C. The public examination of this debtor was held on July 5th at the London Bankruptcy Court, the accounts showing total liabilities of £5,401 (unsecured £3,834) and net assets of £243. In reply to the Official Receiver the debtor said that for some years prior to 1914 he carried on business at his private address, and subsequently acted as manager of a limited company until 1925. He then borrowed £100 and started as an electrical contractor at 2, Little Essex Street, Strand, removing to 28a, Basinghall Street in 1928. During the last two years the business had been unsuccessful, and owing to pressure by creditors he filed his petition last May. The failure was due to lack of capital and bad trade The examination was concluded. The following are creditors:—

	£		£
Alliance Wholesale Electrical Co.	168	Heyes & Co., Ltd. ...	48
British Insulated Cables, Ltd.	44	W. T. Henleys Telegraph Works Co., Ltd. ...	155
Bennett & Fountain ...	58	Higgs, F. & H. F. ...	556
Bisseker, H., Ltd. ...	85	James, H., Junior ...	30
Ball, S.	120	Laws, W.	50
Battley, J....	50	Lightfoot, J., Ltd. ...	81
Bell, A.	30	Macintosh Cable Co., Ltd.	20
Crossley Bros.	26	Rowell, J. B.	25
Cameron, J.	35	Sanders & Co.	132
Edwards, J.	66	Surrey Engineering Co.	50
Ovens, D. C., & Co. ...	62	Tate, S.	101
General Elec. Co., Ltd....	67	Truslove & Co.	88
Garrett, J., & Son ...	88	Wright, J....	701
Greenwood, B.	50	Walsall Hardware Co. ...	82
General Cable Mfg. Co., Ltd.	250	"Z" Electric Lamp and Supplies Co., Ltd. ...	76

C. R. TARVER, 16, Forrest Street, trading as Fred Price Tarver & Co., lately 15, Working Street, Cardiff, electrical engineer.—An application for discharge made by this debtor was heard on July 2nd at the Law Courts, Cardiff. The receiving order was made in December, 1928. In the course of the hearing, it was remarked that the debtor had been very badly treated. The discharge was granted subject to six months' suspension.

COLONEL TEMPEST, electrician, 4, Manns Court, Bradford.—Receiving order made July 3rd, on debtor's own petition.

C. AUSTIN (C. Austin & Son and Austin's Accumulator and Radio Service), wireless accessories dealer, &c., 97, Domestic Street, Leeds.—First meeting July 15th, at the Official Receiver's office, 24, Lower Bond Street, Leeds. Public examination, August 13th, at the County Court House, Leeds.

G. S. HALL (G. S. Hall & Co.), electrical engineer, 55, Malden Road, New Malden.—Trustee, Mr. E. Parke, Official Receiver, Carey Street, W.C., released June 19th.

W. WORSNUP, wireless dealer, 36, Market Hall, Walham Green.—Trustee, Mr. D. Williams, Official Receiver, Carey Street, W.C., released June 19th.

H. A. HYDE, wireless dealer, 148, Weston Park, Crouch End.—Last day for proofs for dividend, July 20th. Trustee, Mr. T. Gourlay, 29, Russell Square, W.C.

A. A. SMETHURST (A. A. Smethurst & Co.), electrical engineer, 62, Bernard Street, Southampton.—Trustee, Mr. J. L. Wilkinson, Official Receiver, Midland Bank Chambers, High Street, Southampton, released June 17th.

R. L. BROCK (R. L. Brock & Co.), electrical engineer, 5, Bedford Row, Tavistock Road, Plymouth.—Last day for proofs for dividend July 17th. Trustee, Mr. J. S. B. Hole, 240, High Holborn, W.C.1.

Company Liquidations.

CHARTER ELECTRIC SUPPLIES, LTD.—Winding up voluntarily. Liquidator, Mr. J. L. Watchurst, Market Gate Chambers, Warrington. A meeting of creditors was held at the office of the liquidator on July 9th. Particulars of claims by July 31st.

ZONE WIRELESS CO., LTD.—First meetings of creditors and contributories July 16th, at Carey Street, W.C.

RADIO ELECTRIC CO. (BOURNEMOUTH), LTD.—First meetings of creditors and contributories, July 16th, at Carey Street, W.C.

HENDON ELECTRIC LAMP CO., LTD.—Winding up voluntarily. Liquidator, Mr. F. Rowlands, 76, Finsbury Pavement, E.C. Meeting of creditors, July 15th, at the liquidator's offices. Particulars of claims to be sent to the liquidator forthwith.

NORTON WIRELESS CO., LTD.—Liquidator, Mr. G. D. Pepys, Senior Official Receiver and Liquidator, Carey Street, W.C., released June 24th.

REFLEX RADIO CO., LTD.—Liquidator, Mr. G. D. Pepys, released June 24th.

Dissolutions of Partnership.

FINNEMORE & WILLS, motor, electrical and general engineers, The Quay, Kingsbridge.—Mr. W. H. Finnemore and Mr. F. Wills have dissolved partnership. Mr. Finnemore will attend to debts due and owing to the late firm and all debts owing by the late firm will be attended to by Mr. Wills.

READ BROS., electrical engineers, 100 & 240a, High Street, Erdington.—Mr. J. H. Read and Mr. H. Bolton have dissolved partnership. Mr. Read will attend to debts.

Private Arrangements.

ENTERPRISE MANUFACTURING CO., LTD., wholesale electrical and wireless suppliers, 83, 85 & 87, Merton Road, Wimbledon, S.W.19.—A conference of the principal creditors was held on July 3rd at Wimbledon. Mr. Leask (Messrs. Leask, Clemens & Co.) occupied the chair. It was stated that at the end of May the liabilities of the company, inclusive of a debenture, were £9,378, against assets of £9,432, and the company was solvent. The company was registered in July, 1917, with a nominal capital of £5,000, and it acquired a business which up to that date had been carried on at Gun Street, Bishopsgate. The assets acquired were valued at £3,000, and shares to that amount were issued to the vendor. Later the business was transferred to Grape Street, Holborn, and later to its present address. The removal took place in order to reduce the overhead expenses, and there had been a saving of about £2,000 since September last year. The company had suffered through burglaries at Grape Street and Wimbledon. The issued capital of the company was £4,452, and a number of shares had been issued for cash. The debenture was issued in favour of the bank in the early part of the current year. During the last six months of 1923 there was a trading loss of £107, but in the following half-year there was a net profit of £577. The company was able to trade successfully up to June, 1926, but during the 12 months to June, 1927, there was a loss of £1,165. During the period from June, 1927, to September, 1928, there was a small profit earned, but since that date there had been a net loss of £200. A balance sheet dated March 31st last showed liabilities of £8,991, and the debenture of £2,000. The assets, however, were substantial, and included book debts estimated to realise £5,453, stock £3,852, furniture and fittings £504, motor-cars, &c. £808, goodwill £1,631, and amounts paid in advance £550. The company had a substantial turnover, and was able to earn a satisfactory rate of gross profit. It was stated that the bank was sympathetic, and it was suggested that the creditors should accept a composition of 10s. in the £, payable by four instalments of 2s. 6d. each, over a period of 12 months. The company's proposals were accepted, and an informal committee was appointed consisting of the representatives of the Mullard Wireless Service Co., the Ever-Ready Co. (Great Britain), Ltd., E.M.I., Ltd., Siemens Electric Lamps & Supplies, Ltd., and the Marconiphone Co., Ltd.

New Moroccan Supply Company.

La Société Cherifienne d'Energie is the name of a company which has been formed in Casablanca, with a capital of one million francs, to establish electrical power distribution systems in Morocco.

Annual Holidays.

Messrs. PARMITER, HOPE & SUGDEN, LTD., Vernon Street, Longsight, Manchester, announce that their works and offices will be closed from Friday, August 2nd, until Monday, August 12th, for the annual holidays.

"Venner" Time Switches in Holland.

So important is the necessity for using the language of the country with which it is desired to trade that we always welcome instances in which this point has been studied. The latest comes from VENNER TIME SWITCHES, LTD., and it takes the form of an illustrated booklet the text of which is Dutch, the prices being given in florins. The publication bears the imprint of the Holland branch of the General Electric Co., Ltd., The Hague. This consideration of the market should certainly lead to extended sales of Venner Schakelklokken.

Social Events.

Favoured by delightful weather on June 22nd, the G.E.C travellers enjoyed their annual river outing. The party travelled from London to Maidenhead by charabanc, and then embarked on the s.s. *Grand Duchess* for a trip to Reading. Over 120 sat down to lunch *en route*, and were presided over by Sir Hugo Hirst. On arrival of the steamer at Reading the party was conveyed to the country house of Mr. M. J. Railing, general manager, and in the spacious grounds Mr. and Mrs. Railing entertained their guests in a large marquee specially erected for the occasion. An amusing feature of the afternoon's games was the cricket match between the Travellers and Departmental Managers, played under novel rules evolved particularly for livening up the game and ensuring a definite result.

The Birmingham and Midland district engineers, employés and staff of Callender's Cable & Construction Co., Ltd., journeyed from Birmingham on June 29th for their annual picnic and to take part in the sports of the parent club at the company's grounds adjoining the Erith Works, Belvedere. They were accompanied by a large number of engineers from the Birmingham Corporation Electricity Supply Department. The Corporation engineers witnessed the sports, after which they returned to London and were entertained to dinner at Frascati's Restaurant, the day being concluded with a visit to the Alhambra Theatre. At the conclusion of the sports the prizes were distributed by Lady Callender, who was accompanied by Sir Tom Callender, and the Birmingham staff were entertained to supper in the canteens before leaving for Birmingham.

The London headquarters staff of Berry's Electric (1928), Ltd., held their first annual outing at Bognor on Saturday,

June 29th. The journey was made by charabanc, and 72 sat down to luncheon, which was served at the Sydney Hotel, and was attended by Mr. Herbert H. Berry (managing director) and other directors. In the afternoon the party drove to Arundel and had tea. Music and a social chat took up the rest of the available time.

The *personnel* of Venner Time Switches, Ltd., with Mr. R. C. Graseby and Mr. E. E. Sharp as their hosts, left Victoria on July 1st in a special train for Margate for their annual outing. On their arrival the clouds lifted somewhat and the weather refrained from spoiling the day. Luncheon and tea for about 420 were served in the café of the "Dreamland" Amusement Park and apart from a message of welcome from the directors there was no speechmaking, leaving as much time as possible for the enjoyment of the good things Margate has to offer. Mr. H. G. White, secretary to the firm, was responsible for the excellent organisation which ensured an enjoyable day.

On June 29th the employés of the L.P.S. Electrical Co., Ltd., journeyed by road to Hastings on the occasion of the annual summer outing, where an enjoyable day was spent. Lunch was provided by the managing director, who presided at the gathering.

Messrs. Walker Bros. held their sixth annual outing on June 22nd. A party of 60 employés journeyed by charabanc from Birmingham to Church Stretton, where lunch was taken. During the afternoon sports were held in Carding Mill Valley, the party returning *via* Much Wenlock and Bridgenorth after tea.

The Mullard Companies recently held their annual outing, which this year was to Margate, by special train, leaving Victoria at 8.30 a.m. Luncheon was provided by the directors of the companies at the Queen's Highcliffe Hotel.

The second annual sports meeting was held at the Sports Ground on the following Thursday, June 20th, when some interesting events were decided. The prizes were presented to the winners by Mrs. S. R. Mullard.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price July 9th.	Fortnight's inc or dec.
a	Acid, Oxalic ... ... per lb.	5¾d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£26	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3¾d.	...
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£187	£3 inc.
	Grade II... ... ... ,, ,,	£132	£2 inc.
	Grade III ... ... ,, ,,	£73	£1 inc.
c	Brass (rolled metal 2' to 12' basis) per lb.	10½d.	...
c	,, Tubes (solid drawn) ... ,,	1/1 to 1/1½	...
c	,, Wire, basis ... ... ,,	11½d.	...
c	Copper Tubes (solid drawn) ... ,,	1/3½	...
c	,, Bars (best selected) ... per ton	£110	...
c	,, Sheet ... ... ,,	£110	...
c	,, Rod ... ... ,,	£110	...
d	,, (Electrolytic) Bars ... ,,	£84 10s.	5s. dec.
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ,,	£94 10s.	5s. dec.
d	,, ,, H.C. Wire per lb.	11¾d.	¼d. dec.
f	Ebonite Rod... ... ... ,,	2/8 to 2/6	...
f	,, Sheet ... ... ,,	2/8 to 2/6	...
n	German Silver Wire ... ... ,,	2/2	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	11¾d.	¾d. inc.
l	Iron, Pig (Cleveland No. 3.) ... per ton	72/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£24 10s.	15s. dec.
g	Mercury ... ... per bot.	£22 2s 6d. to £22 5s.	£1 dec.
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/5	...
p	,, ,, rolled strip & sheet ,,	1/3½	...
p	,, ,, wire... ... ... ,,	1/6½	...
o	Platinum ... ... per oz.	£13 17s. 6d.	...
d	Silicium Bronze Wire ... ... per lb.	1/2½	¼d. dec.
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton	£205 to £205 10s.	£4 inc.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	...

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
W. F. Dennis & Co.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.

Messrs. James Forster & Co., reporting on July 6th, stated that declarations of a considerable quantity of Mexican lead arriving at the end of last week added to the prevailing weakness of the market. Consumption in this country keeps up well, but in view of the state of the market demand is, as a rule, for nearby delivery. Arrivals are coming in more freely now, but still there is no excess. The present weakness is undoubtedly due to the lack of demand in Germany, with the result that surplus supplies are shipped to the London market, where they have a depressing effect on prices.

Estonian Foreign Electrical Trade.

According to the *Board of Trade Journal*, the value of imports of "electric machines, apparatus and implements" into Estonia during April last was 233,000 kr. (about £13,000), while exports of the same class were valued at 53,800 kr. (about £3,000).

The Hammersmith Electrical Engineer's Salary.

The Hammersmith Borough Council recently advertised for a borough electrical engineer at a salary of £1,200, rising by annual increments of £80 to £1,400. The Associated Municipal Electrical Engineers have pointed out to the Council that according to their scale the salary, based on the output of the undertaking for the past year, should be £1,415. They asked that this scale should be adopted. The Establishment Committee, after consulting the Electricity Committee, says that it cannot recommend the Council to accede to the proposal.

German-American Lamp Agreement.

It is reported from Berlin that an agreement has been made between the General Electric Co. of America and the German "Osram" Co. (in which the A.E.G., Siemens and Koppel concerns are interested) for co-operation in the technical and commercial branches of electric lamp manufacture. The General Electric Co. is to acquire 16 per cent. of the Osram Co.'s shares, and Messrs. Owen D. Young, Gerard Swope and Clark Minor are to join the board of the company.

Lighting and Power Notes.

Australia.—VICTORIA.—The *Electrical Engineer of Australia and New Zealand* states that during the quarter ended March 31st last the Electricity Commission sold 83,036,360 kWh, an increase of 7,326,460 kWh over the corresponding quarter last year. The total revenue was £337,676, as compared with £298,261, and the total expenditure £330,597 as compared with £286,146. The net profit, after allowing for interest, depreciation and sinking fund, was £7,079, as against £12,115 for the corresponding quarter last year. During the period seven new centres were supplied with electricity, bringing the total served to 136.

The Electricity Commission is preparing to duplicate its 132,000-V transmission line from Yallourn to Melbourne, in connection with the major extension of generating plant at Yallourn that is to be undertaken shortly. For conductors for the new line aluminium steel-cored cable is to be used, and the Commission has accepted the tender of British Insulated Cables, Ltd., for 360 miles of this. The cable will be made by Metal Manufactures Pty., Ltd., at Port Kembla, N.S.W., and will cost £67,432.

NEW SOUTH WALES.—Tenders from leading British manufacturers are being considered in connection with a scheme for establishing a central power plant to supply electricity to mining companies at Broken Hill. The plant will include six 3,000-h.p. generators and four 1,200-h.p. compressors. The work is expected to be completed in two years and is estimated to cost £300,000.

Barking.—STREET LIGHTING.—The Urban District Council has agreed to a recommendation of the Electricity Sub-Committee that the London County Council be asked to bear the cost of the provision and erection of 114 lamp standards and fittings for the purpose of lighting the streets in that section of the Becontree Estate coming within the Barking area. The estimated cost is £8 12s. 6d. per standard.

Barrow.—YEAR'S WORKING.—The annual report on the working of the Corporation electricity undertaking for the year ended March 31st last, states that there was an increase in the sales of electricity from 16,635,404 to 17,700,214 kWh, but the total receipts showed a decrease of £2,106. That was mainly due to the reduction in charges made during the year. The expenditure was reduced from £61,771 to £60,234, and the gross profit was £44,373, against which were charged interest on loans (£13,086) and sinking fund repayments (£18,174), leaving a balance of £13,113. Out of this had to be provided capital items of £4,134, and depreciation of stores on hand (£438), leaving a net profit of £8,541.

Beckenham.—STORAGE BATTERY RENEWAL.—The Urban District Council has decided to renew the accumulators used in connection with the tramway supply at an estimated cost of £3,060.

Belgian Congo.—HYDRO-ELECTRICAL DEVELOPMENT.—Steady progress is being made by the Société Générale des Forces Hydro-Electriques du Katanga with the establishment of the new hydro-electric power station at Madingusha. About half of the dam has been completed, the foundations of the station building have been laid, and work has been commenced on erecting the masts for a 120,000-V transmission line between Madingusha and Panda. It is hoped that the plant will be completed and in operation during the course of next year.

Birkenhead.—LOAN SANCTIONED.—The Corporation Electricity Committee has received sanction to a loan of £1,754 for h.p. mains extensions to the Pensby and Leighton Hall Estate kiosks.

Birmingham.—YEAR'S WORKING.—We have received from Mr. R. A. Chattock, city electrical engineer, a copy of the accounts of the Corporation electricity undertaking for the year ended March 31st last. The total revenue amounted to £1,703,433, as compared with £1,577,533 in the preceding year. Working expenses increased from £809,939 to £929,979, for which the increase in rents, rates and taxes from £139,242 to £236,919 was largely responsible. The gross profit, therefore, was £773,454, as against £767,614, and to this was added revenue from other sources making £777,436. After payment of capital charges there was a net surplus of £168,435, of which £31,000 was contributed to the borough fund and the remainder placed to reserve. The capital expenditure during the year amounted to £1,470,483, and included £416,668 for buildings, £595,295 for machinery and plant, and £451,027 for mains and services. The total now spent on the undertaking stands at £9,906,251. The electrical energy sold increased from 280,985,406 to 314,560,336 kWh, an increase of nearly 12 per cent., and the average price per kWh obtained fell from 1.347d. to 1.300d. The number of lamp connections in 60-watt lamps increased from 1,028,959 to 1,160,999, and the motor connections in h.p. from 276,332 to 310,470. The number of new consumers connected during the year totalled 11,076.

Bristol.—CHANGE-OVER.—The Corporation Electricity Committee has arranged to proceed with the seventh section of the scheme for the change-over of the system of electricity supply from single-phase to the standard 3-phase system. This section embraces Bedminster, Temple Gate, St. Philip's areas, and a part of the city, at an estimated cost of £56,277.

LOANS.—The Committee is to apply for sanction to borrow £50,000 for sub-station buildings, £70,000 for sub-station plant, and £80,000 for mains.

Burnham-on-Crouch.—TRANSFER OF UNDERTAKING.—The Urban District Council has received a copy of the Burnham and District Electricity (Amendment) Order which the Electricity Commissioners propose to make, and which provides for the transfer of the undertaking from Dr. J. A. Purves to the County of London Electric Supply Co., Ltd. The maximum charge for electricity is to be 8d. per kWh, against 10d. in the original order.

Chapel-en-le-Frith.—OVERHEAD LINES.—Mr. Tucker, inspector of the Ministry of Transport, held an inquiry on July 5th into the proposal of the Trent Valley and High Peak Electricity Co. to place overhead cables in various parts of the district. Opposition was based on the danger of overhead cables on the Buxton Road and their effect on the amenities of the district. The company stated that a section of overhead cable at Disley would cost £380. If the cable were underground on one side of the road only it would cost £760, and if on both sides £1,520. A compromise was agreed to as regards Buxton Road at Chinley.

Chippenham.—DISTRIBUTION LINES.—The Rural District Council has decided to offer no objection to the proposal of the Wessex Electrical Supplies, Ltd., to install overhead and underground distribution lines from Cirencester to Cricklade.

Continental.—POLAND.—The capacity of the power station at Lodz of the Société Générale d'Exploitations Electriques de Lodz et Extensions is to be increased to 76,000 kW by the addition of a 30,000-kW steam turbo-generator.

RUMANIA.—La Société d'Eclairage et Tramways de Braila has recently arranged a new concession with the municipal authorities of Braila. The present lighting concession expires in 1932, and that for the tramways in 1935. Under the new agreement the company will hold both concessions until 1957, and in order to meet the growing demand for electricity and extensions of the tramway system, the capacity of the power station is to be increased from 1,800 to 11,400 h.p. by the addition of two new 4,800-h.p. turbo-generator sets. Not only is the low-pressure distribution system to be extended, but it is intended to establish a h.p. service to supply the various industrial works on the outskirts of the town.

Eastbourne.—ELECTRICITY SUPPLY.—At a recent meeting of the Corporation Electricity Committee it was reported that, in order to control the proposed 11-kV supply taken from the grid it would be necessary to make arrangements for the installation of the first portion of suitable switchgear and transformers. From information received from the Central Electricity Board it would be necessary to install eleven metal-clad switches, fourteen 2-kV feeder panels, four panels for the requirements of the Central Electricity Board, one 5,000-kVA and one 2,000-kVA 11-kV Scott bank. It was decided that four or five of the leading British manufacturers should be asked to tender for this gear.

Epsom.—NEW CHARGE.—The Urban District Council has adopted a new alternative "all-in" two-part tariff to users of electric cookers, with a fixed annual charge, plus ½d. per kWh. The fixed charge is to be based on the floor area, and will range from £2 16s. 8d. on a floor area up to 1,200 sq. ft., to £45 6s. 8d. on an area up to 16,000 sq. ft. Larger premises are to be *pro rata*, and business premises will be included if a cooker is installed.

Leyton.—LOAN.—The Town Council is to seek sanction to a loan of £3,000 for the erection and equipment of a sub-station at Whipps Cross Hospital, and the purchase and laying of a new main from the Leyton Green sub-station to the new sub-station.

London.—HACKNEY.—*Year's Working.*—We have received from Mr. L. L. Robinson, borough electrical engineer, a copy of the statement of accounts of the electricity undertaking covering the year ended March 31st last. The total revenue amounted to £272,586, as compared with £239,998 in the preceding year. Working expenses totalled £121,404 as against £114,983, leaving a gross profit of £151,181 (£125,015). To this were added an unemployment grant of £2,043, a surplus from the sales revenue account of £1,163 and a sum of £96 from the sale of old meters, &c., making the total available £154,483. After providing for capital and other charges there remained a net surplus of £42,174 as against £22,214 in 1927-28. Of this surplus a sum of £9,437 was contributed to the general rate fund and £6,445 was allocated to capital expenditure charged to revenue. The capital expenditure during the year amounted to £103,184 and included £31,371 for machinery and plant and £38,058 for mains and services. The sales of electrical energy increased from 34,378,953 to 39,151,689 kWh and the maximum supply demanded from 19,300 to 20,880 kW. The average price obtained per kWh was 1.56d., the same as for the preceding year.

Long Sutton.—STREET LIGHTING.—The Urban District Council has accepted the tender of the Boston and District Electric Supply Co., Ltd., for street lighting by 60-W lamps at £3 2s. 6d. each per annum.

Madagascar.—HYDRO-ELECTRIC SCHEME.—The Société Electricité et Eaux de Madagascar is establishing a new hydro-electric plant, with a capacity of 10,000 h.p., at Antelomita, to utilise the power of the River Varahina.

Mexico.—NEW PLANT.—A large power plant, to serve the Federal District with light and power, has recently been completed. The installation consists of two turbo-alternators, each of 12,500 kW. The cost involved was 5,000,000 pesos (£500,000). —*Reuter's Trade Service* (Mexico City).

Midhurst.—INAUGURATION OF SUPPLY.—The electricity supply was switched on by the Midhurst and District Electricity Co., Ltd., on July 3rd. A bulk supply is taken from Portsmouth Corporation by underground cable at 11,000 V, 3-phase, *via* Singleton and Cocking, which also receive a supply. The h.p. feeder from Portsmouth, the l.p. distribution in Midhurst, Singleton and Cocking, and all transformers and switchgear, were supplied and installed by Johnson & Phillips, Ltd.

New Zealand.—ARAPUNI.—According to the *Electrical Engineer of Australia and New Zealand* good progress is now being made with the construction of the Arapuni hydro-electric station. One of the 15,000-kW generating sets is practically complete, and the other two are under erection. It is anticipated that power will be available shortly. When the station comes into operation the Government proposes to shut down the Horahora hydrro-electric plant and to cease drawing supplies from the McLaren's Falls plant near Tauranga, the Waihi steam plant and other stations which now help to serve the Waikato distribution system. Next year the Auckland power board expects to draw about 30,000 kW from Arapuni. The demand is continually increasing, and in order to provide for future requirements the Government has authorised the expenditure of £85,000 for installation of a fourth generating unit at the station.

Oldham.—LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £70,000, being the estimated cost of the tie and inter-connecting mains between the new generating station at Slacks Valley and Greenhill station and the existing e.h.p distribution system.

ELECTRICITY SCHEMES.—The Committee has decided to supply electricity by means of slot meters at a charge of 5d. per kWh. The electrical engineer has been instructed to prepare a scheme for wiring houses for electricity on a deferred payment scheme.

Perth.—BULK SUPPLY DECISION.—Regarding proposals to obtain the city's electricity supply in bulk a report was made at a recent meeting of the Corporation Electricity Committee on negotiations with the Grampian Electricity Supply Co., Ltd. The committee recommended that, if the company was unable to give a supply on terms as low as those of the Corporation undertaking, application should be made to the Electricity Commissioners for permission to extend the existing plant.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

MILLOM.—Lighting: From 7d. to 6d. per kWh. Heating: From 2½d. to 1½d. per kWh.

HAWARDEN.—Lighting: A reduction of ½d. per kWh. Power: A reduction of ¼d. per kWh.

BELFAST.—Heating and cooking: Flat rate of 1½d. per kWh up to 20,000 remains the same, 1d. per kWh in excess of 20,000 kWh. Lighting: From 6½d. to 6d. per kWh not exceeding 5,000 kWh, the charge for energy above this amount being unchanged. Private residence flat rate: From 6½d. to 6d. per kWh. Lighting (prepayment meters): From 6½d. to 6½d. per kWh. Lighting (areas adjoining city boundary): From 8½d. to 7d. per kWh. The new rates are recommended to come into force for the quarter ending September next.

TUNBRIDGE WELLS.—Lighting: From 4½d. to 4d. per kWh. Domestic rate: 10 per cent. of the ratable value, plus ¾d. per kWh, and where electric cookers and hot water boilers are installed 10 per cent. of the ratable value, plus ½d. per kWh.

BRIGHTLINGSEA.—*Frinton-on-Sea & District Electric Light and Power Co., Ltd.*—Lighting: To a flat rate of 9d. per kWh. Cooking, heating and power: To a flat rate of 2d. per kWh. Alternative domestic tariff for lighting, heating, cooking, &c.: Standing charge of 20 per cent. on ratable value plus 1½d. per kWh. Special tariff for water heating by means of calorifier on separate circuit: Flat rate of ½d. per kWh. Fixed bedroom heaters on separate circuit: Flat rate of ¾d. per kWh.

Sheffield.—MAINS EXTENSIONS.—The Electricity Committee has approved extensions to mains to cost £5,682.

LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to the borrowing of £25,000 for feeder mains.

Southport.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. E. Moxon) for the year ended March 31st last, show a total revenue of £94,801, working expenditure of £42,085, and a gross profit of £52,716. The figures for the preceding year were: Income, £96,700; working expenses, £41,569; gross profit, £55,131. To the gross profit was added an unemployment grant of £397, bringing the total available for distribution to £53,113. After providing for capital charges there was a net surplus of £18,535, as compared with £23,051 in the preceding year. The sales of electricity increased from 10,874,806 to 12,546,047 kWh and the maximum supply demanded from 5,980 to 7,080 kW. The average price obtained per kWh fell from 2.04d. to 1.73d. A reduction in the charges for electricity was made at the beginning of the year.

Special Orders.—Applications have been made for Special Orders by Warrington Corporation authorising it to supply electricity in part of the rural district of Bucklow; and by Mr. R. Borlase Matthews, authorising him to supply electricity in the rural districts of Belvoir and Hallaton, and parts of the rural districts of Barrow-on-Soar, Billesdon, Loughborough, Market Harborough, and Melton Mowbray in the County of Leicester, the rural districts of Ketton and Uppingham, and part of the rural district of Oakham in the County of Rutland, the dural districts of Barnack, Easton-on-the-Hill, and Gretton, and parts of the rural districts of Kettering, Oundle and Oxendon in the country of Northampton, and certain parishes in the rural district of Peterborough in the county of the Soke of Peterborough.

Sunderland.—YEAR'S WORKING.—The Corporation Electricity Department's report and accounts for the year ended March 31st last show total sales of 32 million kWh. Power consumption showed a slight decrease, but for lighting there was an increase of over a million kWh. There was a general reduction in tariffs, representing £8,000 less revenue last year and £20,000 in a full year. The total income was £188,269, and the expenditure £92,938. Of the balance £32,661 was allocated to interest on capital, £8,636 to income tax, £31,885 to repayment of loans and stock redemption, £26,000 to development, and £1,137 to reserve fund.

Thornton.—LOANS.—The Urban District Council is applying for sanction to the borrowing of £1,800 for underground cable extensions and £1,155 for plant at the Cleveleys sub-station.

Torquay.—ELECTRICITY SUPPLY SCHEME.—It was reported at a meeting of the Corporation Electricity Committee held on July 2nd, that Mr. W. M. Selvey, consulting engineer, had been asked to report upon a scheme for the supply of electricity to ten parishes in the Totnes rural district. The Committee decided that a fee of 50 guineas be paid for the preparation of the report, which is to be considered at a special meeting of the Council at the end of July.

Worcester.—YEAR'S WORKING.—The report of the city electrical engineer on the working of the electricity undertaking states that the total profit for the year ended March 31st last was £2,449 above that of the previous year.

Worksop.—OPPOSITION TO SPECIAL ORDER.—The Whitwell Parish Council has decided to oppose the application of the Worksop Urban District Council for an Order to enable it to supply electricity in the parish. Negotiations are well in hand for the distribution of electricity through a private company and if the scheme materialises the Council has decided to support it.

Tramway and Railway Notes.

Burnley.—YEAR'S WORKING.—The report of Mr. H. Mozley, general manager of the Corporation Tramways and Omnibuses Department, for the year ended March 31st last shows a total revenue from the tramway undertaking of £159,730, as against £161,237 in the previous year. Working expenditure totalled £128,965, as against £133,758, leaving a gross profit of £30,765 (£27,479). From this was deducted a loss of £5,130 on the motor-omnibus system, making a total of £25,635 available. Against this the following charges had to be met:—Capital charges, £18,358; bank interest, £250; rents for tramways owned by outside authorities, £2,696; income tax, £1,404. There was, therefore, a net surplus of £2,927, against £3,259 in the preceding year. The number of passengers carried decreased from 24,040,353 to 23,942,175, but the car miles run increased from 2,125,543 to 2,158,794. The traffic receipts per car mile fell from 18.16d. to 17.71d.

Doncaster.—PROVISIONAL ORDER.—A Provisional Order made by the Minister of Transport authorising the Corporation to run railless cars on eight routes in the borough has been confirmed.

Dudley.—TRAMWAY ABANDONMENT.—At a meeting of the Town Council held on July 2nd it was decided to ratify an agreement submitted by the Tramways Committee for the abandonment of the tramway service.

Liverpool.—YEAR'S WORKING.—We have received from Mr. P. Priestley, general manager of Corporation tramway undertaking, a copy of his report together with the statement of accounts for the year ended March 31st last. The total revenue amounted to £1,567,180, as compared with £1,523,900 in the preceding year. Working expenses increased from £1,202,377 to £1,291,332, leaving a gross profit of £275,848 (£321,523). Interest absorbed £57,145, rent of leased lines £1,087, and sinking fund contribution £63,178, leaving a net surplus of £154,438, of which £75,000 was contributed to the city rate, and the remainder transferred to reserve, renewal and depreciation account. The net profit for the previous year was £221,550. During the past three years £265,000 has been contributed to the city rate. The capital expenditure during the year amounted to £113,391, and included £66,663 for motor omnibuses and £32,204 for land, buildings and fixtures. There was an increase in the number of passengers carried of 8,312,412, the total of 277,899,897 constituting a record for the undertaking. The car miles run increased from 19,647,507 to 21,146,625, but the average earnings per car mile fell from 18.326d. to 17.529d. All the above figures include those for the motor-omnibus services. The new works at Edge Lane were opened by the Minister of Transport and will facilitate the overhauling of the older type of tramcars, of which 24 have been reconstructed on improved lines. A further 48 cars are now being constructed with vestibules. Extensions of the tramcar and 'bus routes were made during the year totalling 31¼ route miles, and there are now 670 route miles of tramcar and 'bus services in operation.

London.—UNDERGROUND GOODS LINE.—The *Financial News* reports that the attention of Mr. J. H. Thomas has been invited to a scheme, sponsored by Viscount Elibank, for the construction of an underground goods railway in London. It is claimed for the scheme that the collection and delivery of goods would be greatly expedited, and that its construction would provide at least four years' work for 60,000 men. Viscount Elibank recently stated that the estimated cost was £40,000,000, and that this capital was available immediately. They had not asked for a Government guarantee on the capital outlay, but they had asked for a guarantee of the interest on the capital outlay. The proposal was to build a railway underground of standard gauge for the carrying of merchandise to all parts of London. A track some 75 miles in length would link up the wharves with the various railway stations and big emporiums in the West End. It would have as many as 54 stations, from all of which goods could be collected and delivered. It is estimated that at least £30,000,000 would be spent in direct employment in the construction of this goods underground railway, and the other £10,000,000 would be required for the purchase of a certain number of overground sites, engineering fees, and other expenses.

UNDERGROUND "SPEED-UP."—The introduction of 100 new motor-cars and an increase in the number of non-stopping trains west of Earl's Court, now enables the District Railway to reduce journey times from Earl's Court to Ealing by three minutes, and journeys to Hounslow, South Harrow, Richmond and Wimbledon by two minutes. This speed-up means an increase of about 10 per cent. in the actual speed of the trains, or from 19 to 21 m.p.h., including stops.

Oldham.—TRACK RENEWAL.—The Corporation Tramways Committee has obtained sanction to the borrowing of £3,939 in respect of the relaying of a portion of the tramway track in Copster Hill Road.

South Shields.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager: Mr. J. Austin Baker) for the year ended March 31st last, show a total revenue of £71,090 as compared with £74,010 in the previous year. Working expenses amounted to £51,725 as against

£55,169, leaving a gross profit of £19,365 (£18,841) to which was added income from other sources, making a total of £21,551 available. After providing for capital and other charges there was a balance of £11,567, against which were charged repayment of mortgage loans, contributions to sinking fund, capital expenditure paid out of the revenue and a net loss of £1,110 on the 'bus services, leaving a net surplus of £1,717, as compared with £660 in 1927-28. The number of passengers carried decreased from 16,648,606 to 14,688,146 and the car miles run from 1,331,976 to 1,031,040. The average total revenue per car mile was 16.5464d.

Walsall.—YEAR'S WORKING.—The accounts of the Corporation tramway undertaking (general manager and engineer: Mr. W. Vane Morland) for the year ended March 31st last, show a total revenue of £57,607 and total working expenditure of £39,696, leaving a gross profit of £17,911. The figures for the previous year were: Income, £78,337; working expenses, £60,271; gross profit, £18,066. An unemployment grant of £136 made a total of £18,047 available. After deducting capital charges there remained a net surplus of £2,839, as against £5,679 in 1927-28. The number of passengers carried fell from 11,698,189 to 9,152,128 and the car miles run from 1,071,676 to 762,231. The average total revenue per car mile increased from 17.543d. to 18.180d.

Telegraph and Telephone Notes.

Argentina.—COMMUNICATION.—It is estimated that there are now 203,502 miles of telegraph wires in operation in the Argentine, equal to 19.1 miles per 1,000 of the population. There are approximately 204,500 telephone instruments in use in the country, equal to 19.2 per 1,000 inhabitants.

Australia.—TELEPHONY.—In 1901 the annual turnover of the Telephone Department was £224,000; now it is more than £5,000,000, according to the Postal Director (Mr. H. P. Brown). The instruments connected increased in the same period from 32,000 to 500,000. Of the receipts, 36 per cent. came from subscribers' rentals, 35 per cent. from local call fees, 25 per cent. from trunk line calls, and 4 per cent. from calls at public telephones and miscellaneous charges. In the last seven years the number of telephones has been doubled. The increase for the last financial year was 34,337.

Canada.—TELEGRAPH SERVICE.—From the beginning of this month the Canadian National Telegraphs took over the Western Union telegraph lines in the Maritime Provinces, thus bringing the whole of the Canadian telegraph system under Canadian ownership.—*Reuter's Trade Service.*

Czecho-Slovakia.—TELEPHONY.—The Telegraphia Company, of Prague, a year and a half ago entered into negotiations with the London representatives of the International Telephone and Telegraph Company for the acquisition of the latter's patents, and in October, 1928, an agreement was reached for technical co-operation. During the past month it is stated that the agreement has been extended in the sense that the Prague Telegraphia Company has obtained the right to establish telephone exchanges in Czecho-Slovakia on the rotary system. Financial participation of the American company in the Telegraphia company has not been arranged in connection with the transaction, but it is stated that the International Standard Electric Company has acquired the shares of the Telegraphia Company which were in the open market. Through the new agreement it is submitted by German interests that an important rival has now arisen in Czecho-Slovakia to the German Siemens concern, which has hitherto had a practical monopoly of the business in that country.

Radio at Sea.—NEW CONVENTION.—The text of the International Convention for the Safety of Life at Sea, signed by the representatives of 18 Governments in London on May 31st has been issued by the Board of Trade. The Convention is to come into force on July 1st, 1931.

The Police Force.—RADIO INTERCOMMUNICATION.—Major T. H. Vitty, engineer to the Metropolitan Police, at the annual general conference of the Chief Constables Association, said that two or three years ago experiments which might lead to intercommunication were carried out, and he hoped that the experiments would soon be resumed. There was no doubt that intercommunication by wireless was coming. The wireless installation at present in use at Scotland Yard had a radius of 50 to 100 miles. There was no technical obstacle to that range being extended. Indeed, apart from the cost, there was no reason why every provincial headquarters in the country should not be in communication with one another and with Scotland Yard by wireless.

The Telephone Service.—FOREIGN TRAFFIC.—Incoming and outgoing international calls during the twelve months to March 31st reached almost 1,000,000, an increase of 34 per cent. on the international calls for the year to March, 1928. Inland trunk calls now number over 100,000,000 a year.

United States.—TELEPHONE EXTENSION.—The Bell Telephone Company has a construction programme involving 7,000,000 dollars for line extensions during the present year.

Radio Notes.

Canada.—ROYAL COMMISSION.—The Royal Commission on Broadcasting has completed its investigation into conditions in Canada and Europe and will submit its findings next month, says *The Times.* Sir John Aird, chairman, indicated at the final meeting at Ottawa that Canadian opinion overwhelmingly demanded Canadian programmes, and that several 50,000-watt stations would be established in Canada to meet the demand. Ninety per cent. of the entertainment for Canadian listeners which was now coming from the United States was heavily charged with propaganda. Canadians also desired programmes from the Motherland by beam wireless, which the Royal Commission anticipated would be possible in the near future.

Formosa.—NEW STATION.—The Department of Overseas Trade informs us that H.M. Consul at Tamsui reports that a small broadcasting station, the first on the island, was opened in November last in Taihoku, the capital, in the offices of the Bureau of Communications. The transmitter (JB type, 1 kilowatt) was supplied by the Tokyo Musen Denshin Denwa Kabushiki Kaisha (Tokyo Wireless Telegraph & Telephone Co., Ltd.). To popularise the service, no fee is being charged at present for listening and the number of applications for licences in the first four months exceeded 8,000. There are no restrictions on the use of receivers; 80 per cent. of those in use are cheap crystal sets. Receivers and accessories on the market have been obtained from dealers in Japan and are almost entirely of Japanese manufacture. Programmes are broadcast daily in the Japanese language; occasionally Chinese music and lectures in English are provided. The original station being in the nature of an experiment, a sum of 665,000 Yen has been set aside in the budget of the Formosan Government for the current financial year for the erection of a new 10-kilowatt station at Itabashi, near Taihoku, with a studio in Taihoku itself. The existing transmitter will probably be transferred to Tainan, in the south. The new station will be opened in the spring of 1930.

France.—BROADCASTING BILL.—The French Broadcasting Bill has provoked much comment, but little serious opposition. To which sixteen transmitting stations will be allocated the wave-lengths allotted to France at the Prague Conference? There are at present eleven State stations and fourteen or so private ones (including Radio-Paris), and the supporters of the latter stations fear that the State will appropriate eleven wave-lengths and that nine, or more, private stations will have to use a common wave-length.

India.—BROADCASTING IN BURMA.—Our correspondent in India states that in view of complaints from the public of Rangoon that the Burma Radio Club is not broadcasting good programmes, the president of the Club proposes to ask the Government of Burma to erect a powerful station which can be heard all over Burma. The present station's power is only 750 watts and its range is very limited. He also protests against the invidious treatment of Burma, for while all the broadcasting companies receive 10 per cent. on all wireless parts imported into India, the Burma Radio Club alone gets nothing. If the Government took over broadcasting it would be able to charge 10 per cent. on imports, which, together with the licence fee, would be sufficient to run broadcasting on approved lines.

Sweden.—THE BROADCASTING INDUSTRY.—A short survey of the Swedish broadcasting industry is given in a review published by the Stockholm Chamber of Commerce on commercial development in Sweden during 1928. Swedish broadcasting activity holds a prominent place from an international point of view and the Swedish industry producing broadcasting apparatus is well-developed. Many thousands of workers are employed in the industry and it is considered that the time is not far distant when Swedish makes will gain markets abroad. Hitherto the production of wireless sets in Sweden has been chiefly for home requirements, and of the total number of receiving sets sold in Sweden it is estimated that 90 per cent. is of Swedish make. Sweden also produces a large number of medium-size transmitting sets up to a maximum of 2 kilowatts. The wireless equipment used by the Swedish mercantile fleet, for example, is entirely produced in Sweden and the same statement applies to wireless sets for military and naval purposes. The equipment at most of the Swedish broadcasting relay stations was manufactured by Swedish factories. The apparatus for the big broadcasting stations, for trans-ocean communication, for example, has however hitherto been imported, the Swedish market being too small to allow of the starting of such production. The year was a remarkable one in the development of the wireless trade, owing to the great popularity of receiving sets working without batteries, which sets have further popularised broadcasting, as they can be operated so simply; they are now being produced in large quantities in Sweden. In 1928 the manufacture of loud-speakers was begun in Sweden; hitherto they had been imported. This new branch of production has already met with considerable success and now practically everything connected with wireless telephony is manufactured in Sweden, with the exception of the apparatus for the high-power stations and certain accessories.—*Reuter's Trade Service* (Stockholm).

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—July 24th. Victorian Railway Commissioners. Electric overhead travelling cranes, spare motors, and trolley wires. (A.X. 8092.)*

August 27th. Posts and Telegraphs Department. Cord-type switchboards. (B.X. 5428.)*

July 23rd. Adhesive insulating tape. (B.X. 5459.)*

SYDNEY.—August 12th. Department of Public Works. Auxiliary hydro-electric generating plant for Burrinjuck. (B.X. 5365.)*

Bangor (N. Ireland).—July 23rd. Borough Council. Iron-clad and cubicle switchgear, 3-phase, 50-cycles, 6,600 and 400/230 V. Three-phase transformers, 200 and 100 kVA. Underground cables for 6,600 and 400/230-V. Meters. (July 5th.)

Chile.—SANTIAGO.—August 16th. Departments de Materiales y Almacenes, Chilean State Railways. Materials, including underground cable, train lighting material, lamps, &c. (C. 3069.)* Telegraph and telephone material, including copper wire and cable, dynamometers, table telephones, telephone cords, &c. (C. 3072.)

Denmark.—FREDERIKSBERG.—July 16th. Municipal Council. Two 10,000-kVA transformers. (B.X. 5435.)*

Egypt.—CAIRO.—August 15th. Ministry of Interior. Diesel-engine alternator for the Zagazig Power Station. (B.X. 5393.)*

Epping.—July 25th. Epping Union. Installation of electric power for the laundry and well at the Institution. (July 5th.)

Gloucester.—August 26th. Committee of Visitors. Electric wiring installation at the Wotton and Coney Hill Mental Hospital. (See this issue.)

India.—Bombay, Baroda & Central India Railway. Electrical overhead travelling cranes, &c. Forms of tender (£1) from Mr. S. G. S. Young, secretary, 91, Petty France, Westminster, S.W.1.

London.—CENTRAL ELECTRICITY BOARD.—July 22nd. Supply, delivery and erection of central indicators and telephones for the Central Scotland Electricity Scheme, 1927. (June 7th.)

July 27th. Supply, delivery and erection of 132,000-V overhead transmission lines for the Mid-East England Electricity Scheme, 1929. (June 28th.)

METROPOLITAN ASYLUMS BOARD.—July 20th. Alterations and additions to electric lighting at Grove Park Hospital, Lee, S.E. (See this issue.)

Newcastle-under-Lyme.—August 24th. Installation of electric lighting in a new wing to be erected at the High School and Orme Girls' School. (July 5th.)

New Zealand.—GREYMOUTH.—August 27th. Grey Electric Power Board. Generating plant for the Arnold River Hydro-Electric Scheme. (B.X. 5422.)*

WELLINGTON.—Post and Telegraph Department. September 7th. V.i.r. wire. (B.X. 5416.)*

Public Works Department. October 15th. Seven 5,500-kVA single-phase auto-transformers and accessories for the Waitaki power scheme. (B.X. 5471.)*

Portuguese East Africa.—LOURENCO MARQUES.—September 11th. Board of Port and Railways. Electric battery tractors and trailers. (A.X. 8172.)*

Renfrewshire.—July 17th. Education Authority. Electrical installation in connection with the gymnasia at Camphill Secondary School, Paisley, and Renfrew High School. Schedules from executive officer (£1 deposit).

Salford.—July 19th. City Council. Sub-station and pit-type single-phase oil-cooled transformers. (See this issue.)

South Africa.—PRETORIA.—Posts and Telegraphs Department. August 1st. Telephone cable. (B.X. 5345.)*

August 8th. Telegraph materials, including iron tubular sidearms, porcelain insulators, paper sleeves, solder and insulating spindles. (A.X. 8112.)*

August 22nd. Telephone apparatus, including extension magneto bells, bell sets, terminal blocks, condensers, magneto generators, carbon protectors, magneto switch extensions, private branch exchange, central battery switchboards, tumbler switches, and wall and table telephones. (B.X. 5415.)*

JOHANNESBURG.—August 1st. South African Railways and Harbours. 10-ton electrically-driven overhead travelling crane for Maritzburg workshops. (A.X. 8105.)*

MIDDLEBURG.—July 29th. Town Council. 100-kW steam-driven alternator and condensing plant, 6,600-V transmission line and switchgear. (B.X. 5348.)*

BULAWAYO.—September 13th. Municipal Council. H.p. overhead transmission lines with accessories and stepdown transformers, pumps and motors with starters, pipework and float control gear. (A.X. 8181.)*

Uttoxeter.—August 12th. Urban District Council. Overhead 11,000 V transmission line. E.h.p. and l.p. cables and roadwork and public lighting. Sub-station equipment. (See this issue.)

* Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Birkenhead.—Electricity Committee. Accepted:—
Five 100-kVA transformers (£445).—English Electric Co., Ltd.
One 200-kVA do. (£139).—Brush Electrical Engineering Co., Ltd.
One 300-kVA do. (£156).—C. A. Parsons & Co., Ltd.
Cable (£745).—Hackbridge Cable Co., Ltd.; (£148) Liverpool Electric Cable Co., Ltd.
Supply and erection of overhead lines to Wirral. Schedule rates.—W. T. Henley's Telegraph Works Co., Ltd.

Chesterfield.—Electricity Committee. Accepted:—
E.h.p. cable for Belmont extension (£374).—Croydon Cable Works, Ltd.
L.p. cable for extension to Holywell Cross (£1,315).—Macintosh Cable Co., Ltd.
Switchgear (£75).—English Electric Co., Ltd.
Equipment for transformer kiosk sub-station for Belmont and Holymoorside area (£257).—Yorkshire Switchgear and Engineering Co., Ltd.

Dartford.—Electricity Committee. Accepted:—
Cable and joint boxes for Zinc Manufacturing Co., Ltd. (£177).—Johnson & Phillips, Ltd.
Cable for ring main scheme (£1,041).—Hackbridge Cable Co., Ltd.
Recommended:—
Cable for Heath Lane (£202).—Hackbridge Cable Co., Ltd.

Leeds.—Electricity Committee. Accepted:—
Repairs to alternator (£2,750).—English Electric Co., Ltd.
Property Committee. Accepted:—
Electric goods lift at town hall (£324).—William Wadsworth & Sons, Ltd.
Electricity Committee. Accepted:—
Cables.—W. T. Henley's Telegraph Works Co., Ltd. (£1,281), Enfield Cable Works, Ltd. (£3,146), Macintosh Cable Co., Ltd. (£5,313), Hackbridge Cable Co., Ltd. (£2,700).

London.—LONDON COUNTY COUNCIL.—Fire Brigade Committee. Accepted:—
Wiring and electrical fittings for seven fire stations (£639).—Alexander Hawkins & Sons.
STEPNEY.—Electricity Supply Committee.
50 tons pitch (£102).—Crow, Catchpole & Co., Ltd.
Meters for 12 months: 5-amp. meters (£1,850), 1-5-amp. demand meters (£1,672).—Reason Manufacturing Co., Ltd.
Prepayment meters (£3,087), 20-amp. meters (£480), 50-amp. do. (£275), 100-amp. do. (£36).—Measurement, Ltd.
200-1,000-amp. combined demand meters (£214).—Aron Electricity Meter, Ltd.
Conduits, troughs and covers (£2,321).—Albion Clay Co., Ltd.
Four 1,500-kW motor convertors and switchgear:—

Ateliers de Constructions Electriques de Charleroi	£19,600
British Thomson-Houston Co., Ltd.	19,934 (Informal)
Metropolitan-Vickers Electrical Co., Ltd. ...	19,983
Bruce Peebles & Co., Ltd.	20,204
General Electric Co., Ltd.	20,236
English Electric Co., Ltd.	20,305

The Committee recommends that the tender of Ateliers de Constructions Electriques de Charleroi be accepted for the provision of two 1,500-kW convertors and switchgear and that of the Bruce Peebles & Co., Ltd., for two 1,500-kW convertors and switchgear.

ADMIRALTY.—Combined switch and socket plugs.—Edison Swan Electric Co., Ltd.

POPLAR.—Electricity Committee. Two 1,000-kW motor convertors and e.h.p. switchgear :—

English Electric Co., Ltd.	£12,806
Metropolitan-Vickers Electrical Co., Ltd. ...	12,609
Mather & Platt	12,677
BRUCE PEEBLES & Co., LTD. (Recommended.)	12,686
General Electric Co., Ltd.	13,413

HACKNEY.—Electricity Committee. Boiler-house equipment :

STIRLING BOILER Co., LTD. (Recommended.)	£310,679
Babcock & Wilcox, Ltd.	312,766
Underfeed Stoker Co., Ltd.	314,729
Vickers Boiler Co., Ltd.	317,300

100-ton overhead electric travelling crane :

HERBERT MORRIS, LTD. (Recommended.)	... £3,040
Vaughan Crane Co., Ltd.	... 3,115
Ransomes & Rapier, Ltd.	... 3,595
Babcock & Wilcox, Ltd.	... 3,928
Stothert & Pitt, Ltd.	... 4,170

Liverpool.—City Council. Accepted :—
Special tramway trackwork.—Hadfields, Ltd. (£2,240); Edgar Allen & Co., Ltd. (£1,555); and Titan Trackwork Co., Ltd. (£1,195).
Overhauling and repairing four of the cooling towers at the Lister Drive power station.—George Lowe and Sons (£3,565).

Maidstone.—Town Council. Accepted :—
Supply and erection of overhead lines from Aylesford to West Malling (£1,361).—Johnson & Phillips, Ltd.

Manchester.—Gas Committee. Accepted :—
Electric goods lift.—Etchells, Congdon & Muir, Ltd.
Watch Committee. Accepted :—
Electric light installation at Newton Street police station.—Maitland & Co. (Manchester), Ltd.
Tramways Committee. Accepted :—
Delmez rail grinder.—Rail Welding Co., Ltd.
Traction motors, automatic circuit breakers and lightning arrestors.—Metropolitan-Vickers Electrical Co., Ltd.
Controllers.—British Thomson-Houston Co., Ltd.
Resistances.—Rheostatic Co., Ltd.
Magnetic sanders.—English Electric Co., Ltd.
Baths Committee. Accepted :—
Electric light installation at Chorlton baths.—Maitland and Co. (Manchester), Ltd.
Education Committee. Accepted :—
Electrical installation at Mobberley open-air school.—R. Seddon & Sons.
Electricity Committee. Accepted :—
Totally-enclosed air-break circuit-breakers.—Allen West and Co., Ltd.
Star-delta switch starters.—Crompton Parkinson, Ltd.; English Electric Co., Ltd.
Alternating-current motors.—British Thomson-Houston Co., Ltd.; Asea Electric, Ltd.; and Crompton Parkinson, Ltd.
Potential and current transformers.—Ferranti, Ltd.
Electric kettles.—Premier Electric Heaters, Ltd.
Time switches.—Venner Time Switches, Ltd., and Nathan and Allen, Ltd.
Electricity meters.—Ferranti, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Edison Swan Electric Co., Ltd., and Measurement, Ltd.
Cables.—Connollys (Blackley), Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Macintosh Cable Co., Ltd.; Standard Telephones and Cables, Ltd.; Pirelli-General Cable Works, Ltd.; W. T. Glover & Co., Ltd.; Hackbridge Cable Co., Ltd.; Callender's Cable & Construction Co., Ltd.; Liverpool Electric Cable Co., Ltd.; Edison Swan Cables, Ltd.; Mersey Cable Works, Ltd., and Ward & Goldstone, Ltd.
Neutral earthing resistance and switch.—Whipp & Bourne, Ltd.
Material and labour involved in extension of 33,000-V mains.—Callender's Cable & Construction Co., Ltd.
Installation of grit arrestor at Stuart Street station.—E. Green & Son, Ltd.
Repairs to motor convertor.—Bruce Peebles & Co., Ltd.
Replating testing battery.—Tudor Accumulator Co., Ltd.
Neutral earthing resistance.—Rheostatic Co., Ltd.
Pipework for feed pump.—Aiton & Co., Ltd.

West Lancashire.—Rural District Council. Accepted :—
Aughton electricity scheme (£13,305); and Maghull and Lydiate extension (£7,868).—W. T. Henley's Telegraph Works Co., Ltd.

Rotherham.—Health Committee. Accepted :—
X-ray apparatus at Oakwood Hall (£553).—Solus Electrical Co.
Electricity Committee. Recommended :—
Two e.h.p. ring main switches (£351).—A. Reyrolle and Co., Ltd.
Automatic switchgear (£565).—British Brown-Boveri, Ltd.
Cable (£6,360).—Hogan & Wardrop.

Wakefield.—Housing Committee. Accepted :—
Wiring 16 houses on Thornes Estate.—W. Robb, Ltd.
Electricity Committee. Accepted :—
Construction of screening pit and foundations at power station (£1,304).—H. Hainsworth.
Two screen wheels (£595).—J. Blakeborough & Sons, Ltd.
Water Committee. Accepted :—
Electrically-driven pumps for filtration works (£250).—Holden & Brooke.

Walsall.—Education Committee. Accepted :—
Electric light installation at Elmore Green School (£102).—Truman Electrical Co.

Forthcoming Events.

International Aircraft Exhibition.—July 16th-27th. Olympia, W.

Institution of Electrical Engineers (London Students' Section).—August 3rd-13th. Summer tour in Paris and Northern France.

Association of Public Lighting Engineers.—September 9th to 12th. Bournemouth. Annual Conference.

The "Electrical Review" Service Department.

INQUIRIES must be accompanied by a stamped addressed envelope.

We should be glad to learn the names of suppliers of the following :—

Electric shock machines (penny in the slot) for use on piers, fair grounds, &c.

Notes.

International Electrotechnical Commission.

In connection with the meeting of the Advisory Committee on Steam Turbines of the International Electrotechnical Commission held in London last week at the Institution of Civil Engineers, a dinner was given by the British National Committee at the Hyde Park Hotel, Knightsbridge, on Thursday, July 4th, immediately preceding the I.E.E. conversazione. About 110 delegates, ladies, and guests were present, representing eight out of the 25 nationalities included in the 18 international advisory committees of the Commission.

Mr. C. P. Sparks, chairman of the British National Committee, presided, and after the toast of "The King," proposed the healths of the monarchs and presidents of the other countries represented on the I.E.C. In proposing the toast of the visiting delegates, he referred to the fact that Lord Kelvin had been the first president of the I.E.C., whose object was to enable purchasers to compare, on a common basis, tenders for electrical machinery from any part of the world. Mr. Sparks mentioned the need for the co-ordination of the many international conventions, representation at which was becoming a heavy tax on the manufacturing and professional interests. The I.E.C. had formed a Committee d'Entente as a clearing house for dates of international meetings and exchange of ideas on the various programmes, but this did not go far enough towards providing a solution of the growing overlapping of efforts.

Professor Clarence Feldman (President of the I.E.C.), replying to the toast, said that the danger of overlapping could only be overcome by the pressure of economic events and the inability of engineers of high standing to attend all the meetings. Mr. Maurice Wilson (chairman of the B.E.S.A.) and Dr. W. F. Durend (for U.S.A. delegates) also replied to the speech of welcome, and referred to the history and work of the Commission, a special reference being made to the initiative of Col. Crompton in proposing its formation 25 years ago. A telegram was sent to Mr. Guida Semenza, expressing the sympathy felt for him in his broken health.

Arrangements were made for an excursion to Oxford on Friday last. On Wednesday of this week the session of the Turbine Committee was succeeded by a meeting at the Institution of Electrical Engineers, of the committee dealing with the rating of electrical machinery.

Appointments Vacant.

Consumers' assistant for Aylesbury Corporation. Electrical engineer for the Commissioners for the Port of Calcutta. Electrical engineer and manager for Gellygaer Urban District Council. Installation engineer for Gloucester Corporation. Assistant to electrical engineer, for Bingley Urban District Council. Electrician-mechanic, for the Public Works Department of the Government of Nigeria. Mains superintendent and assistant rotary sub-station attendant, for Barking Town Urban District Council. (See our advertisement pages to-day.)

Thames Embankment Lighting.

Sir George W. Humphreys, K.B.E., chief engineer of the London County Council, switched on the first five spans of the new Thames Embankment lighting at Westminster, installed by the General Electric Co., Ltd., on June 29th. He was accompanied by Mr. C. A. Baker, divisional engineer of the L.C.C., and also Mr. W. B. Thorpe, engineer-in-chief, and Mr. W. J. Jeffrey, mains engineer of the Charing Cross Supply Co., Ltd. This first instalment of the new lighting of the Embankment more than fulfils expectations, and justifies in full the prediction that this new system of lighting would eclipse any form of street illumination installed hitherto in this country. This is only the first instalment, and consists of five spans of twin overhead units comprising "Wembley" G.E.C. street-lighting lanterns equipped with 1,500-watt gas-filled lamps. These are suspended in pairs at 140-ft. intervals along the roadway, 30 ft. from ground level. When the scheme is completed along the whole length of the Embankment from Westminster to Blackfriars it will certainly be London's best illuminated thoroughfare; it will not, however, be completed for several weeks yet.

The Highfield Shield Competition.

The Association of Supervising Electrical Engineers informs us that in response to representations it has been decided that papers were sent in for the W. E. Highfield Shield Competition may be of any length up to 2,000 words. The Examining Board will be composed of Mr. S. B. Donkin (president), Mr. W. E. Highfield (past-president), Mr. W. Lang, and Mr. T. H. Windibank. In addition to the shield, there will be three prizes for members and two for associates. The time for the receipt of papers expires at 12 noon, September 2nd.

S.W. Midlands Advisory Joint Committee.

The South-West Midlands Advisory Joint Committee has just issued its annual report to the Electricity Commissioners. The district covers an area of upwards of 1,300 sq. miles. The report indicates considerable activity during the year, particularly in the hitherto undeveloped parts of Worcestershire and Warwickshire. The generating plant capacity in the area is 256,500 kW. The units sold show an increase of 12¼ per cent. at 422¼ million units. Perhaps the best test of progress is that the units sold per head of population have increased during the past three years from 191 in 1926-27 to 228 in 1927-28, and to 255 in 1928-29, the number of consumers having increased during the past year by 20 per cent.

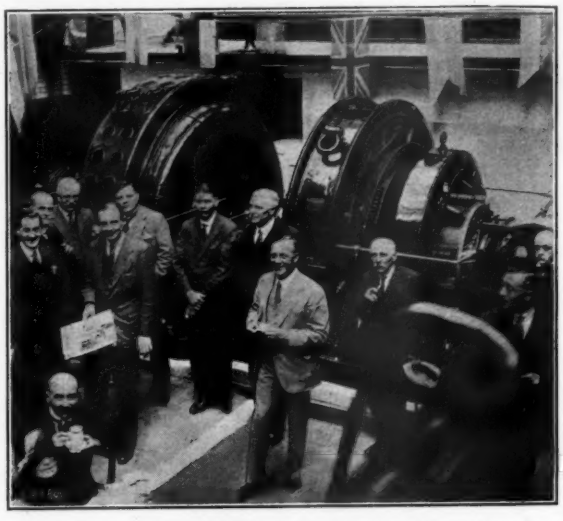
Wandsworth Electricity Charges.

Alderman S. Cresswell, chairman of the Wandsworth Consumers' Organising Committee, has received a letter from the Electricity Commissioners stating that Sir Harry Haward and Mr. Lackie propose to reopen the adjourned inquiry, on July 18th at the Town Hall, Wandsworth, into the applications by the Wandsworth Borough Council and consumers in Wandsworth for a revision of the maximum prices which the County of London Electric Supply Co., Ltd., may charge under the Wandsworth Electric Lighting Order, 1892.

Extensions at Ilford.

On Thursday last week, at the electricity works of the Ilford Corporation, a 1,500-kW auto-synchronous motor-generator set, complete with apparatus for power-factor regulation, was officially inaugurated by the Mayor of Ilford, Alderman Gunary. The set consists of a 6,600-V, 3-phase auto-synchronous motor mechanically coupled to a 1,500-kW, 500-V, d.c. three-wire generator, complete with a static balancer, exciter and control gear. The h.p. motor is of the Crompton-Parkinson self-starting type; it is constructed in the same way as an ordinary 3-phase induction motor, with the addition of a mechanically-coupled exciter on the same bedplate. The rotor is wound two-phase, three-wire, the neutral point being connected directly to one terminal of the exciter and the other two connections to the two-phase liquid starter. One side of the exciter and the common connection of the two-phase starter are at earth potential. The motor is started in precisely the same way as an induction motor, *i.e.*, by switching in the stator circuit and operating the rotor starter; the motor runs up to speed and pulls automatically into synchronism. When running up the set the exciter rapidly builds up its own field, causing a direct current to flow in the rotor circuit; this current is superimposed on the alternating currents induced by the stator and forms definite poles in the rotor, with the result that the machine pulls into synchronism. Under synchronous conditions there is, of course, no current induced by the stator in the rotor windings. Power factor correction is obtained by varying the exciter current in the rotor windings automatically by means of a shunt regulator in the exciter field, controlled by a governor. A rotating induction motor element is used, having series and shunt coils biassed in a definite position, so that, with the alternating current and voltage in phase with each other, or at a definite leading current, the rotating element will remain in an intermediate position. In the event of phase displacement, the rotating element revolves in one direction when the current lags behind the voltage, and in the opposite direction when the current leads; this causes the shunt regulator to move, decreasing or increasing the field strength of the exciter and ensuring automatic correction of the power factor. The fundamental principle on which the apparatus works depends on the idle current in any portion of the circuit or the current in quadrature with the potential difference acting across that portion of the circuit. This correction is based on the assumption that the current and voltage follow sine laws; any harmonics that may exist in the current curve and not in the voltage curve will be wattless or idle current. The apparatus is connected in such a way that its operation depends on the idle power ($EI \sin \phi$) and that the excitation is varied, causing the motor to absorb a definite leading current from the line to compensate for inductive loads elsewhere.

It is of interest to note that a similar set has been installed at the Uphall sub-station at Ilford. At the ceremony, Mr.



The New Set at Ilford; Mr. Collis (foreground) Explaining "Points."

A. G. Collis, M.I.E.E., chief engineer, switchgear section, Messrs. Crompton-Parkinson, Ltd., outlined briefly the technical features and advantages of the set, stressing particularly the fact that a p.f. improvement from 0.6 to 0.8 meant an addition of 30 per cent. of load on the mains. Mr. Windibank, director, Crompton-Parkinson, passed a vote of thanks to the Mayor, and presented the latter with a silver cigarette box as a souvenir of the occasion. The new set, he said, brought the capacity of the Ilford plant up to 9,000 kW. During the proceedings tribute was paid to Mr. A. H. Shaw, M.I.E.E., engineer and manager, Ilford, on his enterprise in installing the plant.

Fatality.

Tape used by electricians for insulation purposes was condemned at an inquest at Derby last week on George J. House (48), an electrician employed by Messrs. Balfour, Beattie and Co., contractors to the Derbyshire and Notts Electric Power Co., of Spondon. Wm. Hope said he left House brushing down a wall near some cable joint boxes, and on returning later found him lying on the ground. There were marks of burning on the cable joint, indicating that the man had touched it and received a fatal shock. The voltage was 6,600. Mr. H. W. Swann, a Home Office expert, said that the insulation tape was to some extent rendered brittle by having been pulled tightly over the sharp surface presented by a joint, and that it was thus impaired. Although such tape was invariably used it was the experience of the Home Office that it had been responsible for a number of fatalities. It would be far better if the metal sheathing of the cable were extended, failing which there should be some mechanical protection. The jury returned a verdict of "Accidental death," and recommended that more layers of tape should be placed over a joint.

Educational.

A large number of mining students from Bathgate, Bo'ness, and other continuation-class centres in West Lothian were shown over the mining electrical works of Messrs. Anderson and Boyes, Motherwell, on July 6th.

Complete courses of instruction are provided in engineering, including electrical and chemical engineering, at the Royal Technical College, Glasgow. Prospectus from the Secretary. (See our advertisement pages to-day.)

A Lusty Infant.

In a recent interview Thomas A. Edison was asked: "Comparing the electrical industry with the life of a human being, an industry which is your own child and therefore was an infant, say, forty years ago, at what stage of life do you think it now stands? At middle or old age?" Edison: "Yelling baby."

Institution Notes.

Institution of Electrical Engineers.

CONVERSAZIONE.—The annual conversazione of the Institution of Electrical Engineers was held on Thursday evening, July 4th at the Natural History Museum, South Kensington. The attendance numbered about 1,040, among whom were many foreign guests present in London as members of the Steam Turbine Committee of the International Electrotechnical Commission. After the reception by Lieut.-Col. K. Edgcumbe (president of the Institution) and Mrs. Edgcumbe, supported by members of the Council, a programme of music was given in the Central Hall by the string band of the Royal Engineers and a vocal and instrumental concert in the Reptile Gallery. The artistes in the latter case were Miss Dora Labbette (soprano), Miss Yvonne Morris ('cello), Mr. Norman Stone (tenor), and Mr. Frank Lafitte (piano). Light refreshments were served throughout the evening.

STUDENTS' PREMIUMS.—The Council of the Institution has made the following awards of premiums for papers read before the Students' Sections during the 1928-29 session :—

Premiums of the value of £10 *each* to Mr. E. J. Evans for his paper on "Feed Heating by Extracted Steam in Generating Stations"; to Mr. R. C. Henniker, B.Sc. (Eng.), for his paper on "The Commercial Testing of Power Transformers"; and to Mr. F. Roberts for his paper on "Errors in Current and Voltage Measurements at High Frequencies."

Premiums of the value of £5 *each* to Mr. V. E. Connor for his paper on "The Manufacture and Testing of Submarine Telegraph and Telephone Cables"; to Mr. T. A. Long for his paper on "The Loading of Transformers on a Thermal Basis, with special reference to Temperature Indicators"; to Mr. V. P. Mackay for his paper on "Power Factor Correction"; to Mr. C. F. J. Morgan, M.Sc., for his paper on "The Resonance Method of Wave-form Analysis"; to Mr. H. H. Taylour for his paper on "Electric Welding"; and to Mr. D. J. Watkins, B.Sc., for his paper on "Electric Locomotives."

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

As will be seen from our report of last week's annual meeting of the General Electric Co., Ltd., Sir Hugo Hirst, Bt., announced that it was proposed to make Mr. M. J. RAILING joint managing director of the company with himself. The great expansion of the company's interests has rendered this step desirable, and Mr. Railing proved during Sir Hugo's prolonged absence in Australia during the past year that he is well able to carry the weight of this important position in the electrical manufacturing industry.

Mr. Railing's association with the General Electric Co. dates back 38 years, that is, almost to its inception, and during that period he has risen from a junior position to be the company's general manager; he has held the latter appointment for the past 18 years. During his occupancy of the post he has witnessed, and has been largely instrumental in bringing

Elliott & Fry] [*London.*

Mr. M. J. Railing,

Who is to be joint managing director of the General Electric Co., Ltd.

about, great changes and expansion in the company's affairs. New branches have been established at home and overseas, works have been greatly enlarged, and additional works acquired and set in operation; several subsidiary companies have been co-opted, and all of them have been amalgamated into one centralised organisation, demanding supervision of a very exacting nature. Only a man of courage and rare capacity for detail could have succeeded in performing the arduous administrative work which this has entailed. Mr. Railing is very happy in his relations with the company's staff and employés, and has inculcated a spirit of co-operation throughout the great organisation.

We heartily congratulate Mr. Railing upon his appointment, and wish him continued health and strength to enable him to carry the burdens which it imposes upon him.

The retirement of Mr. C. P. SCOTT, after 57 years as editor of the *Manchester Guardian*, makes a break in an era that must be unequalled in the history of daily journalism. For many years Mr. Scott has also been proprietor of the famous journal (which has so often lent colour to the adage "What Manchester thinks to-day, England will think to-morrow"), and thus provides a classic illustration of the happy results following the ability of a proprietor to take a close personal interest in the production of his paper. We regard Mr. Scott's retirement as a break in, rather than the end of, an era; since he is to continue as governing director, and will be succeeded as editor by a son, Mr. E. T. Scott, who may be trusted to maintain the high traditions of the *Manchester Guardian*. His Majesty the King, by his message to Mr. Scott, has conferred an honour on British journalism.

In consequence of the retirement on superannuation of Mr. JAMES WITTER, superintendent of installations, Newport Corporation Electric Supply Department, the following reorganisation of the Installation Department has taken place: (*a*) Mr. A. E. AIRD, assistant electrical engineer, is appointed electrical installation engineer; (*b*) Mr. R. C. BURTON, domestic supply engineer, is appointed assistant electrical engineer; (*c*) Mr. T. L. BOWLER, assistant superintendent of installations, is appointed superintendent of installations; (*d*) Mr. S. W. HILLSDON, wireman, is appointed assistant superintendent of installations.

At a recent meeting of the Worcester City Council it was proposed that the salary of Mr. C. M. SHAW, the city electrical engineer, should be increased from £1,000 to £1,150 on the understanding that he undertook the duties of development officer for the city. This was not accepted, but a proposal that Mr. Shaw should be appointed development officer at a nominal salary of £50 per annum was carried.

Mr. S. HARTLAND, assistant mains engineer at the Gillingham (Kent) municipal electricity works, has resigned.

Mr. C. W. CHARLESWORTH, works manager of Marconi's Wireless Telegraph Co., Ltd., Chelmsford, who is leaving to take up another appointment, has been presented by the staff with a gold cigarette case, together with a gold vanity case for his wife.

Consequent upon the recent resignation of Mr. W. H. PEAKE from the position of managing director of the Relay Automatic Telephone Co., Ltd., the company has appointed Mr. B. B. JOHNSON (chief engineer) and Major BURNINGHAM WHITE (general sales manager) as joint general managers.

The marriage took place at Broomfield, Chelmsford, on June 29th, of Mr. ALAN V. SOWMAN, assistant manager of the Manchester branch of Crompton Parkinson, Ltd., and their representative in the Liverpool district, and Miss WINIFRED THWAITES, a member of the Chelmsford staff of the firm.

Mr. S. R. MELLONIE has resigned his position on the technical staff of the Metropolitan-Vickers Electrical Co., Ltd., which he has held for six years, upon his appointment as electro-technical assistant to the chief electrical engineer of Salford. He takes up his new duties on August 10th.

The Kelvin Medal Award Committee, after considering representations receiving from leading engineering bodies in all parts of the world, has awarded the Kelvin Medal for 1929 to Monsieur ANDRE BLONDEL (France). The medal is awarded as a mark of distinction in engineering work and investigation of the kinds with which Lord Kelvin was especially identified. Monsieur Blondel, as engineer of the Ponts et Chaussées since 1889, and for many years chief engineer of the lighthouse services, is distinguished by his work on signalling

apparatus, both optical and electrical, and particularly for his investigations in connection with electrical measuring apparatus and photometry. In 1913 he became a member of l'Academie des Sciences and in 1923 was appointed Inspecteur Général des Ponts et Chaussées. He is regarded by French electrical engineers as their most distinguished member, and is also an honorary member of both the British and American Institutions of Electrical Engineers.

Mr. H. WILLOUGHBY-ELLIS, A.M.I.E.E., the new president of the E.C.A. Allied Associations, has been active in electrical affairs for many years. He was associated with some early rural electrification work in the Buckingham and Bicester districts and later on acted as engineer to the "Brush" agency in London. The firm of Ellis and Ward was founded in 1898 in Birmingham, and a few years later the head office of the company was transferred to its present address in Portugal Street, W.C.2. During all these years, Mr. Willoughby-Ellis's firm has carried out much important work all over the United Kingdom and abroad. Mr. Willoughby-Ellis is also interested in the manufacture of electrical plant and machinery on a large scale. In other fields of science, Mr. Willoughby-Ellis has been president of the Birmingham Philosophical Society; fellow and vice-president of the Entomological Society of London; and he is a past-president of the Midland Microscopists' Union. He is also a fellow of the Zoological and Geological Societies, a member of the Ornithologists' Union and Club, and one of the eight members of the "Entomological Club," claimed to be the oldest scientific society in the world. His large private collections dealing with these subjects are amongst the most important existing in the country.

Mrs. MAY M. MCDOWELL has been appointed lady demonstrator at the Liverpool Corporation electrical showrooms, Whitechapel.

Mr. S. F. PALMER, general manager for Australia of Ferguson, Pailin, Ltd., electrical engineers, Marrickville, has left for England by the *Ventura* to visit the company's works at Manchester.

Mr. S. R. MULLARD is relinquishing his position as managing director of the two Mullard companies in order to devote more of his time to other interests. Mr. Mullard will retain his office as chairman of the Mullard Wireless Service Co., Ltd., and director of the Mullard Radio Valve Co., Ltd., and will act in an advisory capacity to both companies.

The marriage took place on June 22nd at Colchester, of Mr. KENNETH L. THEOBALD, who holds a responsible position in the research department of the "beam" station at Rugby, and was formerly on the staff of Marconi's Wireless Telegraph Co., Ltd., Chelmsford, and Miss Mabel M. Betts, of Norwich.

Mr. H. MCNAUL, electrical engineer to the Gellygaer Urban Council for nearly ten years, has accepted an important appointment in the Midlands.

Admiral H. W. GRANT, C.B., has joined the board of the Globe Telegraph & Trust Co., Ltd.

At a meeting of the Council of the Royal Society of Arts on July 2nd, the Duke of Connaught (president) presented the Albert Medal for 1929 to Sir J. ALFRED EWING for his work in magnetism and services to technical education.

Mr. W. J. GLENNY, O.B.E., Inspector-General of Overseas Services of the D.O.T., has been appointed to succeed Mr. W. Peters, C.M.G., as Commercial Secretary (Grade I) for Sweden. Mr. Glenny, who will hold the personal rank of Commercial Counsellor, expects to take up his new duties towards the end of this month.

The Widnes Town Council has appointed Mr. W. IBESON, A.M.I.E.E., as lecturer in engineering at the Municipal Technical College. Mr. Ibeson has been on the staff of the Huddersfield Electricity Department, and a part-time lecturer in electrical engineering at the Huddersfield Technical College and is resigning these posts.

Mr. W. POYNTER ADAMS, A.K.C. (Lond.), M.I.E.E., who has resided in Cornwall for the past seven years, was on June 28th married at the church of St. Mary Magdalene, Ribbleton, Lancashire, to Mrs. MARY HOLT, of Knutsford, Cheshire.

Mr. H. C. GODSMARK, chief technical assistant of the rolling stock department of Manchester Corporation Tramways, has been appointed rolling stock superintendent to the Nottingham Tramway Department.

Mr. H. FRANCIS WHITE, marine contracts manager of the Radio Communication Co., Ltd., has been appointed manager of that company.

The marriage took place at Salford, on June 26th, of Mr. HARRY BROOKS, of Messrs. W. T. Glover & Co., Ltd., and Miss MURIEL CLARKE, of Salford.

Obituary.—MR. W. S. ANDREWS.—The death is reported from Schenectady, N.Y., at the age of 81, of Mr. William Symes Andrews. Mr. Andrews, who was a native of Saltford, Somerset, went to America in 1875, and shortly afterwards joined Mr. T. A. Edison. He served in various capacities in a number of Edison concerns, and was particularly active in X-ray work.

MR. A. D. GOODALL.—The death is announced, at the age of 72 years, of Mr. Alexander D. Goodall, J.P., who for 40 years had been in business as an electrician at 4, East Norton Place, Edinburgh.

COUNCILLOR G. F. FAIRLESS.—We regret to learn that Councillor G. F. Fairless, chairman of the Stockton Electricity Committee, succumbed to meningitis after three weeks' illness on Monday last. He was 46 years of age and well known in London and Scottish engineering circles, being head of the Fairless Engineering Co., Stockton, and chairman of the Engineering and Lighting Equipment Co., Ltd., St. Albans. A widow, three daughters and a son survive him.

MRS. HAINSWORTH.—We extend our deepest sympathy to Mr. Hainsworth, commercial assistant, Croydon Electricity Department, upon the death of his wife on Monday after a long illness.

Will.—The late Mr. WILLIAM A. FAIRGRIEVE, principal of Fairgrieve Bros., Ltd., electrical engineers, Sunderland, left £6,481 (£5,617 net personalty).

Financial Section.

New Companies, Returns of Share Capital, Debenture Charges, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Endoric Radio & Gramophone Co., Ltd.—Private company. Registered July 5th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, wireless, mechanical and general engineers and contractors, suppliers of electricity, manufacturers of and dealers in gramophones, radio gramophones, wireless instruments and television, electrical and other apparatus, &c. The first directors are:—R. H. C. King, Brampton, Leicester Road, New Barnet, merchant; R. G. McCall, Hillside, Oak Avenue, The Ridgeway, Enfield, radio engineer (both permanent).

Boroughbridge and District Electric Supply Co., Ltd.—Public company. Registered July 4th. Capital, £10,000 in £1 shares. Objects: To acquire the benefits of the Boroughbridge and District Electricity Special Order, 1928, made by the Electricity Commissioners in favour of R. F. Winder, authorising the supply of electricity within the townships of Boroughbridge, Aldborough, Minskip, Roecliffe, Ellenthorpe, Kirby Hill, Landthorpe and Milby, together with certain personal property and assets belonging to the said R. F. Winder and used in connection with generating, accumulating, distributing and supplying electricity within the said area, and together with certain real and personal property belonging to R. F. Winder and C. E. Winder. Purchase consideration £12,000 (£9,000 cash and £3,000 debentures). The first directors are:—C. E. Winder, Boroughbridge, R. F. Winder and R. Winder, Belgrave Electrical Works, Cross Belgrave Street, Leeds, all electrical engineers; and N. F. Winder, 209, Roundhay Road, Leeds, physician and surgeon. Solicitors: D. Green, Boroughbridge.

Electric Power Finance Corporation, Ltd.—Registered as a public company July 3rd. Capital, £100,000 in 1s. shares. The objects are to carry on business as bankers, financiers, capitalists, underwriters, general merchants, contractors for public and other works, engineers, shipowners and builders, machinists, steel and iron merchants, ironmasters and founders, and manufacturers of engines, tools, machinery, and plant; to participate in financial, commercial, industrial, manufacturing, electrical, railway, navigation, and other businesses, works, &c. The first directors are:—C. S. Goddard, 10, Park Road, Richmond, Surrey, chartered accountant; E. S. White, 4, Eslington Terrace, Newcastle-on-Tyne, naval architect; Lt.-Col. J. J. O'Sullevan, Royal Societies' Club, 63, St. James Street, S.W. Registered office: Winchester House, Old Broad Street, E.C.2.

Rolyat Electrical Co., Ltd.—Private company. Registered June 29th. Capital, £500 in £1 shares. Objects: To adopt an agreement with Mary D. Taylor, and to carry on the business of electricians, mechanical, wireless, telegraph or telephone, electrical, motor or experimental engineers, manufacturers of and dealers in electrical and wireless apparatus, gramophones, musical instruments, motor vehicles, &c. The first directors are:—S. A. Taylor, 188, Streatham Road, Mitcham, Surrey, wholesale wireless factor and manufacturer (managing director and permanent chairman); Mary D. Taylor, 11, Furzedown Market, Tooting, S.W.17, wireless dealer and electrician. Registered office: 11, Furzedown Market, Tooting, S.W.17.

Electric Welders (Slough), Ltd.—Private company. Registered June 29th. Capital, £2,000 in £1 shares. Objects:—To carry on the business of electric welders and manufacturers of welded products and structures, engineers, founders, smiths, machinists, electricians, haulage contractors, &c. The directors are:—W. A. D. Crombie, United Sports Club, 4, Whitehall Court, S.W.; R. J. Longley, A.M.I.C.E., Greta Cottage, Saltburn-by-the-Sea, Yorks. Solicitors: E. L. Reynolds, 11, Mackenzie Street, Slough.

British Household Appliances, Ltd.—Registered as a public company July 1st. Capital, £1,000 in 2s. shares. Objects:—To carry on the business of manufacturers and producers of and dealers in all kinds of household and domestic utilities and appliances, fixtures and fittings, furniture, utensils and goods. Power is taken to carry on business as motor and radio engineers, electricians, &c. The first directors are:—G. Thompson-Melrose, 93, Richmond Road, Ilford, accountant; G. M. Nicholson, 2, Fordingley Road, Maida Hill, W.9, company secretary. Registered office: 1, Budge Row, E.C.4.

Court Radio Co., Ltd.—Private company. Registered July 3rd. Capital, £4,000 in 750 deferred and 3,250 ordinary shares of £1 each. Objects: To acquire the business of radio and gramophone retailers and engineers now carried on at 115, Piccadilly, W.C., by E. A. Turner, trading as the "Court Radio Co." The permanent directors are:—E. A. Turner (chairman), 492, Caledonian Road, N.7; Capt. W. R. Bailey, Cavalry Club, Piccadilly, W.1. Registered office: 115, Piccadilly, W.1.

Improved Wilson Microphone & Electrical Co., Ltd.—Private company. Registered July 5th. Capital, £100 in 1s. shares. Objects: To carry on the business of electrical or wireless dealers, financiers, promoters, &c., and to adopt an agreement with W. Hyams and J. B. Bignamy. The directors are:—W. Hyams, 54, Atherfold Road, Clapham, S.W., electrical engineer; J. B. Bignamy (chairman), 11, Sinclair Mansions, Richmond Road, W.12, electrical engineer (joint managing directors). Secretary: J. McGuire, 4, Lloyd Square, W.C.1.

Edibell Sound Film Apparatus, Ltd.—Registered as a public company July 5th. Capital, £200,000 in 2s. shares. Objects: To adopt an agreement with J. J. Bamberger, W. C. Jeapes and C. Jeapes, and to carry on business as manufacturers and producers of and dealers in all kinds of machinery, apparatus and appliances for recording and transmitting sound, pictures and the like, kinematograph and photographic machines, cameras, phonograph records and gramophones, mechanical and electrical engineers, electricians, &c. The subscribers (each with one share) are:—A. Wilson, 62, Myddleton Square, E.C., accountant; H. J. Self, Oriel Lodge, Marlow, Bucks., advertising agent; and five clerks. The first directors are to be appointed by the subscribers. Registered office: 40 & 41, Old Broad Street, E.C.2.

Official Returns of Electrical Companies.

National Electric Lamp Co., Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1928 (filed March 6th, 1929). All shares taken up. £100 paid. Mortgages and charges, nil.

Sennybridge Electric Supply Co., Ltd.—Capital, £1,500 in £25 shares. Return dated June 30th, 1928 (filed March 22nd, 1929). 48 shares taken up. £1,200 paid. Mortgages and charges, nil.

Westminster Engineering Co., Ltd.—Capital, £25,500 in £1 shares (13,000 ordinary and 12,500 preference). Return dated November 6th, 1928 (filed February 9th, 1929). 8,560 ordinary and 9,279 preference shares taken up. £14,039 paid on 6,560 ordinary and 7,479 preference, £3,800 considered as paid on 2,000 ordinary and 1,800 preference. Mortgages and charges: £3,000.

H.P. Electrical Co., Ltd.—Capital, £1,000 in £1 shares. Return dated March 15th, 1928 (filed April 2nd, 1929). 654 shares taken up. £654 paid. Mortgages and charges, nil.

Central Electrical Engineers Accessories Supply, Ltd.—Capital, £100 in £1 shares. Return dated December 31st, 1928 (filed March 21st, 1929). All shares taken up. £100 paid. Mortgages and charges, nil.

Radiant Electrical Co., Ltd.—Capital, £100 in £1 shares. Return dated January 14th, 1929. All shares taken up. £100 paid. Mortgages and charges, nil.

Invincible Electrical Engineering Co., Ltd.—Capital, £1,000 in £1 shares. Return dated January 12th, 1929. 400 shares taken up. £400 paid. Mortgages and charges, nil.

Nelson Electric Co., Ltd.—Capital, £50,000 in 5s. shares. Return dated January 1st, 1929. 90,007 shares taken up. £10,001 15s. paid on 40,007 shares, £12,500 considered as paid on 50,000 shares. Mortgages and charges: £4,600.

Moreland Electric Welding Co., Ltd.—Capital, £4,000 in £1 shares. Return dated December 31st, 1928 (filed April 16th, 1929). 1,762 shares taken up. £1,762 paid. Mortgages and charges, nil.

Peerless Electrical Manufacturing Co., Ltd.—Agreement dated June 8th, 1929 (supplemental to debenture dated May 22nd, 1928, securing all moneys due or to become due from the company to Lloyd's Bank, Ltd.) charged on hire-purchase agreements, and the insurance policies and other material documents connected therewith.

Express Magneto (Repairs) and Electrical Co., Ltd.—Mortgage on land and premises in Holloway Street, Exeter, dated June 20th, 1929, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £450.

M.E.D.A.S., Ltd.—Particulars filed of £2,200 debentures authorised by resolutions of May 30th and June 6th, 1929, charged on the company's property, present and future, including uncalled capital, the amount of the present issue being £1,855.

Full Light Anti-Dazzle Lamp Co., Ltd.—Debenture dated June 19th, 1929, to secure £1,000, charged on the company's property, present and future, including uncalled capital. Holder: F. S. Leuw, 46, Sheldon Avenue, Highgate.

City Notes.

General Electric Co., Ltd.

The annual meeting was held at Magnet House on July 4th. Sir Hugo Hirst, Bt. (chairman), who presided, in presenting the annual report (ELEC. REV., June 28th, p. 1157), said that it was the twenty-ninth annual meeting since the G.E.C. was formed into a public company, but the concern was in existence eleven years prior to that; therefore he considered it the fortieth annual meeting since the inception of the company. In reviewing the accounts he pointed out that the increase of £26,000 in the profits was very small considering the increased turnover in most of the departments, but for a variety of reasons, mainly over-production in the industry, and foreign importation, prices during last year had shown a tendency to drop, and it required great effort to obtain a much greater volume of business to maintain the earning capacity of the company. The item "Liquid Cash and Investments in British Government Securities" was slightly less than last year, partly due to the fact that they were able to acquire for cancellation a certain amount of debentures which were offered in the market, and had thereby slightly expedited the normal redemption procedure. On the debit side, under "Capital Authorised," was recorded the creation of 1,600,000 British ordinary shares, none of which had as yet been issued. The company had increased the number of branches and depôts in the United Kingdom in order to give better service to the ever-increasing number of people interested in the purchase of electrical products. They had acquired by purchase Clare House, adjoining Magnet House, in order to find additional accommodation for the growing staff. The great virility with which the Central Electricity Board had taken up its functions had created a new outlook on electricity supply, and whilst during the period of the creation of that authority the industry suffered a distinct hold-up, sufficient indication was now given as to future requirements and they had been able to re-arrange all their works accordingly. For instance, at Fraser & Chalmers' Engineering Works they had had to build larger units. The standards which had been adopted for the new power stations were 30,000 kW at 3,000 r.p.m., and 50,000 kW at 1,500 r.p.m. They had completed designs and tests for both sizes and had taken contracts for Birmingham and Battersea, which would be completed in the near future. They had correspondingly to increase the units on the electrical side produced at the Witton works. They had developed an overhead distribution system which had been approved by the Electricity Board, and had been successful in obtaining a £750,000 contract for overhead distribution for London and the South of England. In order to meet the demand for 132,000-V switchgear they had considerably increased the switchgear works at Witton, and they had in hand orders for the Board for the whole of the 132,000-V sub-stations for the Central England area. The Pirelli-General Cable Works had received a contract for 52 miles of 132,000-V oil-filled cable, the first installation of the kind in Great Britain and the largest in the world. The award of that contract was due mainly to the successful results obtained by the Pirelli

oil-filled cable which had been laid in America and had been working successfully for some time. The cable industry was extremely busy, and they had shared in the demand by obtaining other important contracts, including one for 25 miles of 66,000-V cable, and another, for Sydney City Council, for 60 miles. There was also a great demand for telephone cables, and they had in hand not only important contracts for the British Post Office, but also for the Dominions and other overseas countries, the most important contract being one for the Egyptian State Railways which they had obtained against world competition. Co-operation between their different factories had led to an ability to equip complete plants, for coalmines, steel works, textile mills or any other industry. Sir Hugo quoted an example of a complete contract carried out by the company for the Indian Copper Corporation. Realising the importance of the mineral wealth of the Empire, they had at Fraser & Chalmers particularly developed the section devoted to mining machinery, conveying plant, &c. But however welcome those important engineering contracts were, they were accompanied by such technical risks that the profit generally was not adequate. They had also been active in the lighter side of engineering. The Coventry Telephone Works, which produced automatic exchanges, were also actively engaged, in conjunction with the Valve Works, in the wireless industry. Sometimes those studies led to application in quite different fields; for instance, their experience in automatic telephones had led to considerable orders for apparatus in connection with the installation of the totalisator on racecourses. Other studies had equipped them for the possibility of entering the speaking-film business from the equipment point of view. They were continuing the study of better and cheaper lighting through their Illumination Department. The Thames Embankment lighting scheme, which was just being completed, was one result. They had further developed their factories for ebonite, glass, lamp caps, moulded insulation material and others which supplied essential raw materials. Progress was being made in the domestic appliances department. Wherever the price of electricity had been reduced an increasing demand for electrical commodities showed itself.

During the last twelve months he had visited Australia as a member of an Economic Mission. Although he did not go on the company's business, in every country at which he touched he was able to meet engineers. The information gained was most valuable, and it had readjusted his views on the electrical needs of those countries. He had learned that we must study the local needs of each territory better than we had done in the past; we must realise that an English standard article, however good, was not necessarily suitable for overseas countries; we must practice closer personal touch by more frequent visits of responsible people to those countries, so that their experience when they came home was taken notice of in our shops and offices; and we must realise that certain countries had a keen desire to produce certain commodities themselves. They offered us collaboration, and our finance and technical skill should be freely offered within the limits of the economic conditions of each territory. He was able to counter false impressions by giving evidence of the virility of most of our modern industries and the recovery of our older ones, and of the happier relations now existing between employers and employed.

The G.E.C. organisation had functioned most efficiently during his absence. The principal responsibility rested on Mr. M. J. Railing, and it was his intention shortly to ask Mr. Railing to be a joint managing director with him. The business was developing in all directions so fast that that step was desirable in the interests of the future of the company. During the recent controversy in connection with the British ordinary shares, he predicted that they would have plenty of imitators. This had been justified and in numerous cases action had been taken to secure British control of important companies. The stand which they had made had drawn attention to that very important problem, and public opinion was beginning to see that their aims were right. That justified their action in preferring to withdraw from the controversy and to wait until public opinion was better informed on the subject.

The report and accounts were adopted.

British Empire Trust Co., Ltd.

The annual meeting of this company was held on July 1st. Mr. J. Davidson (chairman and managing director), who presided, said that the British Columbia Power Corporation, Ltd., owned electrical plants with a developed capacity of 202,300 h.p. and capable of expansion to 638,800 h.p. Construction work was proceeding on schemes at Bridge River and Ruskin, which would ultimately develop 420,000 h.p. The report of the Winnipeg Electric Co., stated that it had acquired and was developing a new site at Seven Sisters Reach which had a potential capacity of 225,000 h.p. The first development was for 42,000 h.p. Referring to the report of the West Gloucestershire Power Co., Ltd., he said that this showed an increase in sales of over 2,000,000 kWh in 1928 as compared with 1927. Its area of supply was now 679 sq. miles, the capacity of the station was 22,500 kVA, and the transmission system totalled 146 miles of mains, while an additional 23 miles were now under construction. Bulk supply agreements had been concluded and were in operation with the City of Gloucester, the Stroud Electric Power Co., Ltd., and the Chepstow Electric Lighting & Power Co., Ltd. The report and accounts were adopted.

Edmundsons' Electricity Supply Corporation, Ltd.

The accounts of this company were abstracted in our issue of June 28th, p. 1159, and the annual meeting was held on July 5th. Sir James Devonshire (chairman), who presided, in presenting the report and accounts, said the undertakings with which the company was connected had again increased their connections by over 6,000 kW, and reductions in the charges for electricity were made in a number of undertakings during the year. The ordinary share capital was increased during the year to £1,250,000. 600,000 shares were issued by way of capitalisation of reserves, and 250,000 shares were issued for cash, the latter being to provide funds for the redemption of the debenture stock. The schedule of investments and advances showed an increase of £222,975, additional shares in the Cambridge, Guernsey, Isle of Wight, Ilfracombe, Melton Mowbray, Ramsgate, Salisbury, Surbiton, Urban, Wycombe and Yeovil companies having been taken up. The report and accounts were adopted.

At an extraordinary general meeting which followed, the increasing of the capital of the company to £3,150,000 by the creation of a further 1,500,000 ordinary shares of £1 each was approved. The new capital is required for the acquisition of not less than 90 per cent. of the issued share capital of the East Anglian Electric Supply Co., Ltd., and the Wessex Electricity Co., and investments in certain other electricity supply companies.

Prospectus.

Edibell Sound Film Apparatus, Ltd.—The registration of this company is recorded in the "New Companies" section of this issue. On Monday last the company offered for subscription 1,100,000 of its 2,000,000 shares of 2s. each, at par. The prospectus gave the names of the directors as Messrs. J. J. Bamberger, Thomas Hough (director, Edison Bell, Ltd.), H. W. S. Howard (director, Metropolitan Cinema Investment Corporation, Ltd.), and W. F. Robbins (director, Edison Bell, Ltd.). The company is to acquire an invention for the synchronisation of film and sound covered by two patent applications, and has a contract with Edison Bell, Ltd., for the supply of sound-reproducing apparatus and accessories. It is claimed that the company will be in a position to deliver about 100 installations a month within a very short period, and that a contract for 500 installations has already been secured. The purchase consideration payable is £10,000 in cash and £29,200 in fully-paid shares; the company expects to have £27,000 available as working capital.

North Wales Power Co.

The report for 1928 shows a profit of £77,102, and after payment of debenture interest, £25,136 remains, to which is added £1,404 brought forward, making £26,540. Of this sum £1,404 has been transferred to special interest reserve, and £5,000 to special renewals fund. The remaining balance of £20,136 will be transferred to special interest reserve account. The new power station at Maentwrog was brought into operation during the latter part of the year, and the sales of electrical energy during 1928 increased by approximately 11 per cent. Since the close of the year two important transactions have taken place. First, the company has entered into a contract with the Central Electricity Board; and, secondly, a scheme for the financial reorganisation of the company has been carried through. Messrs. K. M. Clark, S. G. Bibby, A. F. Bott, and S. F. C. Cuffe have retired from the board, and Messrs. G. V. Twiss and G. Wansbrough were appointed to fill vacancies in the directorate.

The Underground Group.

The companies constituting this group have declared their dividends for the half-year ended June 30th. In addition to the preference dividends, the following are the rates of distribution on ordinary capital:—

Metropolitan District Railway Co.—Ordinary stock: 2½ per cent. (the same).

London Electric Railway Co.—Consolidated ordinary stock: 2½ per cent. (the same).

City and South London Railway Co.—Consolidated ordinary stock: 2½ per cent. (the same).

Central London Railway Co.—Undivided ordinary stock: 2½ per cent. (the same); preferred ordinary stock: 2 per cent. (the same).

Underground Electric Railways Co. of London, Ltd.—Ordinary shares: 3 per cent. (the same).

Associated Equipment Co., Ltd.—Ordinary shares: 4 per cent., free of tax.

Dubilier Condenser Co. (1925), Ltd.

The net profit for the year ended March 31st last was £15,947, and after allowing £4,900 for taxation and adding £12,005 brought forward, there is £23,052. No ordinary dividend is recommended (last year 5 per cent.), and after allowing £12,000 for preference dividend, £11,052 is carried forward. The report states that there has been an increased volume of business, but owing to a great falling off in home construction of radio sets and the greater purchasing by the public of manufactured sets, there has been a change in the destination of the bulk of the sales from the retailer to the manufacturing trades. This has adversely affected the company's profits. The company has been approached by several manufacturers of broadcast receivers with a view to amalgamation, and negotiations have been entered into and are still proceeding.

Petters, Ltd.

After providing for depreciation, taxation, &c., the net profit for the year ended March 31st last was £32,891, as compared with £25,634 in 1927-28. After meeting preference dividend and funding certificate service and transferring £10,000 (against £5,000) to reserve, it is proposed to maintain the ordinary dividend at 6 per cent. The business during the past year has been satisfactory in view of the prevailing conditions in the engineering industry. Extensions have been carried out at Yeovil to enable the company to manufacture larger sizes of engines. A new Atomic Diesel engine has been introduced in sizes of 25 h.p. and upwards.

Greenwood & Batley, Ltd.

The annual meeting was held on July 1st, Col. O. C. Armstrong (chairman) presiding. In presenting the report and accounts, the chairman said that the past year's history of the company had been more or less a repetition of the preceding lean years through which it had been passing. In spite of seven years' continuous bad trade, it was able to maintain a dividend on the ordinary shares of 5 per cent. Considering the great difficulties with which the engineering trade had had to contend during that long period, it was a fairly satisfactory record. The report and accounts were adopted.

Scottish Power Co., Ltd.

The company has offered to purchase the undertaking of the Fife Tramway, Light and Power Co., Ltd., for £1,025,000. The directors of the Fife Co. have provisionally accepted the offer.

An extraordinary meeting of the Scottish Power Co. is to be held on July 15th to consider resolutions raising the capital from £2,500,000 to £4,000,000.

Bagdad Tramways and Electric Lighting Syndicate, Ltd.

The directors have advised the shareholders not to accept an offer which is reported to have been made for their holdings at the rate of 15s. for each "A" share and 1s. for each "B" share. They state that a new generating station is in contemplation which will enable the company to deal with additional consumers.

W. & T. Avery, Ltd.

The balance of revenue account for the year ended March 31st last, including £53,987 brought forward, is £171,244. It is proposed to pay a final dividend of 10 per cent. on the ordinary shares, making 15 per cent. for the year (as for 1927-28), and to transfer £20,000 to reserve, leaving £54,328 carried forward.

West Gloucestershire Power Co.

An extraordinary meeting is to be held on July 15th for the purpose of considering resolutions increasing the capital to £685,000 by the creation of 85,000 6½ per cent. participating preference shares of £1 each.

British Power and Light Corporation (1929), Ltd.

The corporation announces that as from July 1st it has acquired all interests in the subsidiary companies of the Power Development Co., Ltd., which will in future be controlled and managed by the corporation.

Great Northern Telegraph Co.'s Holding Co., Ltd.

The directors recommend a dividend for the first financial year ended June 30th last, of 20 per cent., transferring £5,555 to reserve and carrying forward £5,062.

Belliss & Morcom, Ltd.

The net profit for the year ended March 31st last was £26,531. The directors propose to pay a final dividend of 2½ per cent. making 12½ per cent. for the year on the ordinary shares.

International Hydro-Electric System.

The board has declared as the first quarterly dividend on the Class "A" stock, a stock dividend at the rate of one-fiftieth of a share for each share held, or 50 cents in cash.

Birmingham District Power and Traction Co., Ltd.

An interim dividend of 3 per cent. has been declared on the ordinary shares.

Chiswick Electricity Supply Corporation, Ltd.

An interim dividend of 7½ per cent. has been declared on the ordinary shares, as last year.

Traction and General Investment Trust, Ltd.

An interim dividend of 6 per cent. has been declared on the ordinary shares for the half-year ended June 30th.

Yorkshire Electric Power Co.

An interim dividend at the rate of 6 per cent. per annum has again been declared on the ordinary shares.

Electrical Distribution of Yorkshire, Ltd.

The ordinary shares are again to receive an interim dividend at the rate of 9 per cent. per annum.

Clontarf and Hill of Howth Tramroad Co.

An interim dividend at 3 per cent. per annum has been declared.

Stocks and Shares.

MONDAY EVENING.

MONETARY conditions have shown a tendency to relax their stringency, now that the first half of the year has turned, and, with the current Stock Exchange settlement, a fairly light affair, the pressure caused by money market considerations became somewhat less. It cannot be said, however, that the fear of Lombard Street is removed from Stock Exchange eyes. Every Thursday morning, before the Bank Rate announcement is made, a qualmish feeling develops in the Stock Exchange markets. On the other hand, some of the gilt-edged stocks that are quick to reflect the changing aspects of the money market have firmed up to a slight extent.

The Home Railway Market.

Home Railway stocks are heavy, under the influence of the railwaymen's demand that the 2½ per cent. wages deduction, agreed to some time ago, should now be restored. Also, the miners want reduction of their eight-hour day. Taken together, these two factors proved too much for the strength of the Home Railway market, where prices have fallen fairly heavily. The Undergrounds are sympathetically dull, in spite of the announcement of interim dividend payments which are all the same as those of a year ago. Interim dividends of 2½ per cent. are to be paid on Metropolitan District, London Electric, and City and South London. On Central London preferred ordinary 2 per cent. is announced; the deferred dividend comes at the end of the year. London General Omnibus shares will receive 3½ per cent., free of tax, Associated Equipment 4 per cent., also tax free, and Underground Electric ordinary 3 per cent., less tax. The price of the last-named shares is 6d. down at 22s. 6d., and the income bonds at 108 show a loss of 2 points. Districts at 75½ have again shed 10s., and Metropolitans at 59½ are 1 lower.

The New Introductions.

Dealings started on Monday in this week in the new stocks of Cables & Wireless, Ltd. There is a little market in the non-assented Marconi shares and cable issues, but by far the bulk of the dealing will be in the new securities. The opening prices of the ordinary, preference, and "B" stock were 82, 92 and 72, respectively. Buyers immediately snapped up the stocks, and the prices rose to 87½, 96½, and 80½. It will be seen that these work out to about 75s. 9d. for Marconis, 275 for Eastern Telegraph ordinary stock, and 27½ for the Eastern Extension and Western Telegraph shares.

Some little time will be required before the market settles down to the new shapes in which the stocks are being negotiated, but investment has no difficulty, as a rule, in adapting itself to altered conditions of this nature, and the Merger's 5½ per cent. preference stock is regarded as a sound security, the price of which will be dependent, to some extent, upon fluctuations in the market for money. The ordinary stock is of a different nature, and a little doubt is expressed as to whether it will receive, for the first twelvemonth, the full 7½ per cent. to which it is entitled. Possibly a year or two may be required before the 7½ per cent. becomes distributed, after which, of course, the "B" stock will rank for dividend, and, as this possesses what can be called the equity of the business, the real speculation will centre round it. It is thought that the American buyers of Marconi shares may elect to sell back to Great Britain their holdings of Cables and Wireless preference and ordinary, retaining the "B" as possessing the greatest prospect of future appreciation. How the market will develop is, of course, a matter of conjecture, but those who looked for the opening prices of the new stocks to be on the basis of 90s. for Marconis, and 300 for Eastern Telegraph stock, are naturally disappointed. Prices of the "old" cable stock and shares have recovered appreciably. Marconis dipped to 73s. 3d. on unexpected sales: these concluded, the price rallied to 76s. Marconi Marines gave way to 3, Marconi £1 shares to 4½, and Canadian Marconis to 30s.

Stock or Shares?

The market in the new stocks is not assisted by the fact that the Stock Exchange Committee has decided that dealings must take place, at all events for the present, in stocks instead of shares. This robs the market of elasticity, for shares are more easily handled than stock is, and they appeal to a wider circle of public interest. The objection raised to the new issues being quoted as shares lies in the question, at present being debated, as to whether it is necessary or not for shares to carry distinctive numbers. As the capital of the Merger amounts to over 53 million pounds, it is felt that distinctive numbering of such a huge amount in shares might lead to the confusion which, it is shrewdly surmised, exists in the offices of certain big corporations whose capital is mainly in numbered shares.

Electricity Supply.

Changes in the electricity supply share-list are few, but Northamptons have weakened to 50s. and Bournemouth and Poole to 64s. 6d. Midland Counties, too, have come on offer and can be bought at 34s. Egham and Staines at 34s. 6d.

are 1s. 9d. lower, the new shares being relatively down at 33s. 6d. On the other hand, Electrical Distribution of Yorkshire have gained a trifle, at 37s., North Metropolitans are 53s. 6d., Isle of Thanet ordinary at 35s. 6d. are down 1s., the preference at 26s. 3d. being 3d. lower. Atlas ordinary, after being 27s. 9d., drooped to 27s. 4½d.; the preference are 23s. 6d. British Power and Light at 18s. 7½d. stand at 1s. 4½d. discount. Considerable activity is afoot in connection with coal carbonisation schemes. The Low Temperature Carbonisation Company started a new plant at Doncaster last week, and the Bussey Company's process is to be put to a practical test immediately.

Scottish Power Extension.

The reason for the fall of 1s. 6d. in Scottish Power shares is that the company has given notice of an increase of capital, by the creation of 1,500,000 new shares of £1 each, which, if agreed to by the shareholders, will raise the share capital to £4,000,000. New money is required to enable the Scottish Power Company to carry out the purchase of the Fife Company's undertaking. Notices to this effect were sent out by the Fife Company earlier in the week.

London Traction.

London and Suburban Traction preference weakened to 11s., this small group, as a whole, being dull, on the fears mentioned here before, concerning the present Government's advice to Parliament to throw out the London Traffic Bills. London Suburban ordinary shares stand at 3s., and London United Tramways ordinary last changed hand at 1s. 3½d. Metropolitan Electric Tramways ordinary have not been dealt in since the middle of March, the last bargain being marked 5s. 6d. A transaction took place at the end of last week in the company's preference shares at 7s. 6d. United Automobile Services preference were done the other day at a guinea.

Dollar Stocks.

Hydro-Electrics have been a very active market, and, after rising to 45½, the shares shed a dollar, the supply coming, as usual, from Belgium. The price of the "B" preferred is a little easier on the week, at 8. International Holdings improved to 8¼. Brazilian Tractions have also shown considerable liveliness and a modest rise, thanks to the earnings which the company publishes, and to the support which these stimulate from Montreal. The shares make, moreover, a favourite speculative counter for the in-and-out operator on this side, where they have quite a large following. Bullish confidence is based on expectation of further expansion of profits in the near future. The other dollar stocks are firm, International Telephone and Telegraph at 107½ being 8¼ points up on the week, while American Telephone and Telegraph at 240, ex dividend, shows a gain of 11 points. British Columbia Power "A" and "B" are 46¼ and 30, respectively. Of the Mexican utilities, the Light and Power Company's common shares are 1 better at 75½. The Anglo-Argentine Tramways report had no effect upon the prices of the company's issues.

Manufacturing, and Other Shares.

Amongst shares in the manufacturing companies, Henley's, after their substantial rise, have reacted to 6¾, and there has been a fairly sharp fall in Siemens, which took the price to 28s. 9d. Electric Constructions are also weak at 16s. 3d. British Aluminium shed a florin, going back to 48s., and Brush ordinary went down a point to 135. Associated Electric ordinary, after being better, reacted to their previous price of 50s., General Electrics, at 2 9/16, experienced no change as a result of last week's meeting—which was as placid as certain recent predecessors had been disturbed. An outstanding feature is the strength of rubber shares. The market has taken on a new lease of life, at all events temporarily, owing to an improvement in the price of the raw material, added to which there is going on, at the present time, a certain amount of changing over from Home Industrials into other shares assumed to be less liable to depreciation on account of political considerations. These last-named, combined with labour questions, are responsible for heaviness amongst iron and steel shares, Vickers having dropped to a shade below 9s. Babcock & Wilcox are still dull at 62s., and the market for these descriptions as a whole is anything but bright. Ever-Ready shares went back to 20s. Very persistent advices are in circulation to buy Sphinx Electric shares. There are safer investments than these to be found in the stock markets.

Electricity in Canada.

At the meeting of the Hudson's Bay Company, the chairman took the use and cost of electricity for comparison between conditions as they exist in Great Britain, and in a country to which "Nature has given a background on a great scale, and where people respond by doing things in a large way." He quoted Winnipeg's population of 300,000 as consuming last year one-third as much electricity as London and the Home Counties combined, with their population of over eight millions of people. The average price paid by the domestic consumer in Winnipeg, he said, was something less than one halfpenny per unit, against 3½d. per unit in London. Cheaper electric power is the foundation upon which industries in Western Canada may rest secure.

Share List of Electrical Companies.

HOME ELECTRICITY COMPANIES.

	Nom.	Approx. Dividend. 1927.	1928.	Price July 8 1929.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	64/6	−1/4	4 13 0
Brompton Ordinary	1	8½	8½	26/-	—	5 7 8
Charing Cross Ordinary	1	8½	8½	26/6	—	5 5 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8¾	8¾	26/6	—	5 5 8
City of London	1		10	38/3	—	4 4 6
do. do. 6% Pref.... ...	1		6	23/-	—	5 4 4
Clyde Valley	1		8	26/3	—	... ...
County of London	1	7½	10	56/-	—	3 11 5
do. do. 6% Pref.... ...	1	6	6	23/-	—	5 4 4
Edmundson's 7% Pref.	1	7	7	25/-	—	5 12 0
Elec. Supply Corporation	1	11	11	55/-	—	4 0 0
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	29/-	—	5 3 5
London Electric	1	8½	9	28/-	—	5 0 0
Metropolitan	1	9	9	47/6	—	3 16 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	6½	34/-	−6d.	3 16 6
Mid. Elec. Power	1	15	8	37/6	—	4 5 4
Newcastle-on-Tyne Ordinary ...	1	6	6	27/-	—	4 9 0
do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	1	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	31/-	−1/6	5 3 3
South London	1	8½	8½	26/6	—	5 5 8
Urban Ordinary	1	7	—	2	—	... ...
Westminster Ordinary	1	8½	8½	26/-	—	5 7 8
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	24/3	—	6 3 8
Yorkshire Elec.	1	8	8	37/-	—	4 6 6

HOME RAILS.

Central London Ord. Assented ...	Stock	4	4	72	—	5 11 1
Metropolitan	,	3	3½	£9½	−1	5 17 8
do. District	,,	4	5	75½	−½	6 12 5
Underground Electric	£1	5	7	22/6	−6d.	6 4 6
do. do. Income ...	Bonds	6	6	103	−2	5 11 1

TELEGRAPHS AND TELEPHONES.

Anglo-Am. Tel. Pref.	Stock	6	6	103	—	5 16 6
do. Def.	,,	1½	1½	24½	—	6 2 5
Automatic Telephone	1	10	12½	2	−1/2	6 5 0
Eastern Extension	10	10	10	27½	+⅛	*3 13 10
Eastern Tel. Ord.	Stock	10	10	270	+5	*3 14 1
Globe Tel. and T. Ord.	10	10	10	27½	—	*3 12 9
do. do. Pref.	10	6	6	11½	—	5 6 6
Great Northern Tel.	10	20	17½	30½	−¾	5 14 9
Indo-European	25	10	10	50½	—	*4 19 0
Marconi	10/-	10	20	76/-	—	... ...
Marconi-Marine	1	12½	15	3	−½	5 0 0
Oriental Telephone Ord.	1	12	12	3 1/16	—	... ...
Western Telegraph	10	10	10	27½	+⅛	3 13 10

HOME AND FOREIGN TRAMS, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3 7/16	—	8 0 0
do. do. 2nd Pref. ...	5	6	6	3½	—	8 11 6
do. do. 5% Deb. ...	Stock	5	5	74½	—	6 14 3
British Electric Traction Def. Ord.	,,	5	5	13/5	—	... ...
do. do. Pref. Ord.	,,	8	8	128xd	—	6 5 0
Brazil Traction	100	7	8	60½	+½	3 6 1
Brit. Columbia Elec. Rly. Pcc. ...	Stock	5	5	94½	—	5 5 10
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	11/-	−6d.	... ...
London United Tram Deb. ...	Stock	4	4	60	—	6 13 4
Mexico Trams, 5% Bonds	—	5	5	75½	—	6 12 9
Mexican Light Common	100	Nil	Nil	74½	—	... ...
do. 7% Pref.	100	7	7	74½	—	9 8 0
do. 1st Bonds	—	5	5	77½	—	6 9 0
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

MANUFACTURING COMPANIES.

Assoc. Elec. Ord.	1	6	—	2½	—	2 8 0
Babcock & Wilcox	1	13	15	62/-	—	*4 16 9
British Aluminium Ord.	1	10	10	48/-	−2/-	*4 3 4
British Elec. Transformer Pref. ...	1	7	7	13/9	—	9 6 8
British Insulated Ord.	1	15	15	3½	—	3 17 4
Brush Ord.	Stock	10	10	135	−1	7 8 1
Callenders	1	15	15	3½	—	3 17 4
do. 6½% Pref.	1	6½	6½	1½	—	5 4 0
Crompton Parkinson Ord.	5/-	—	—	21	—	... ...
do. 8% Pref.	1	8	—	25/-	—	6 8 0
Edison-Swan 1st Pref.	1	7½	7½	25/9	—	7 1 2
do. 5% Deb.	Stock	5	5	84½	—	5 18 4
Electric Construction	1	7½	5½	16/3	−½	6 15 4
Enfield Cable Ord.	1	20	20	4½	—	4 9 0
English Electric	1	Nil	Nil	6/3	—	... ...
do. do. Pref.	1	3	Nil	7/6	—	... ...
Gen. Elec. Pref.	1	6½	6½	33/-	—	5 13 1
do. Ord.	1	10	10	2 1/16	—	3 18 2
Henley...	1	25	30	6¾	−¼	4 14 1
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber		Nil	Nil	15/-	—	... ...
Johnson & Phillips		10	—	36/3	—	5 10 4
Siemens Ord.	1	7½	7½	28/9	−2/-	5 4 4
Telegraph Construction	12	10	10	23½	—	*4 19 3

* Dividends paid free of Income Tax.

Swiss Foreign Electrical Trade.

Imports and Exports in 1927 and 1928.

THE following statistics, showing the import and export trade of Switzerland in electrical and allied goods in 1928, have been taken from the recently-issued official trade returns. The figures for 1927 have also been given, and notes added of any increases or decreases. The returns show the most important, but not all, of the countries of origin or destination of the goods.

Imports.

	1927. Thous. fr.	1928. Thous. fr.	Inc. or dec. Thous. fr.
Electrical cable, not insulated—			
Total	80	65	− 15
From Germany	34	36	+ 2
,, France	30	21	− 9
,, United States	16	7	− 9
Insulated cable not lead covered or iron armoured—			
Total	299	324	+ 25
From Germany	268	287	+ 19
,, France	21	31	+ 10
Cable covered with lead—			
Total	60	503	+ 443
From Germany	60	502	+ 442
Cable covered with lead and iron armoured—			
Total	100	298	+ 198
From Germany	92	294	+ 202
Cable insulated with rubber or paper and covered with textiles—			
Total	303	440	+ 137
From Germany	154	255	+ 101
,, France	19	38	+ 19
,, Holland	113	118	+ 5
,, Great Britain	3	11	+ 8
Cable ditto covered with lead—			
Total	357	423	+ 66
From Germany	275	361	+ 86
,, Belgium	58	33	− 25
,, Great Britain	—	17	+ 17
Dynamo-electric machines and transformers—			
Total	2,404	3,518	+1,114
From Germany	1,094	1,895	+ 801
,, France	346	449	+ 103
,, Italy	264	73	− 191
,, United Kingdom	146	129	− 17
,, United States	207	277	+ 70
,, Holland	319	632	+ 313
Accumulators and batteries—			
Total	3,301	4,642	+1,341
From Germany	1,456	1,947	+ 491
,, Italy	62	72	+ 10
,, France	437	540	+ 103
,, United States	245	192	− 53
,, Austria	91	212	+ 121
,, United Kingdom	850	1,577	+ 727
Steam engines, cranes, pumps, turbines, &c.—			
Total	270	343	+ 73
From Germany	229	249	+ 20
,, United Kingdom	—	30	+ 30
,, United States	38	60	+ 22
Electric arc lamps—			
Total (mainly from Germany)	38	48	+ 10
Electric incandescent lamps, mounted—			
Total	2,448	3,482	+1,034
From Germany	629	1,062	+ 433
,, Austria	285	320	+ 35
,, Holland	1,112	1,543	+ 431
,, France	106	201	+ 95
,, Hungary	245	272	+ 27
Insulators, mounted—			
Total	546	431	− 115
From Germany	184	149	− 35
,, United States	107	185	+ 78
,, Denmark	225	80	− 145
Electric meters—			
Total	647	676	+ 29
From Germany	557	590	+ 33
,, France	52	36	− 16
Telegraph and telephone apparatus—			
Total	5,002	6,973	+1,971
From Germany	2,379	3,168	+ 789
,, United Kingdom	352	610	+ 258
,, Sweden	111	106	− 5
,, France	683	520	− 163
,, Belgium	660	672	+ 12
,, United States	203	334	+ 131
Electrical apparatus not elsewhere mentioned—			
Total	4,159	5,016	+ 857
From Germany	2,214	2,642	+ 428
,, France	181	244	+ 63
,, United Kingdom	1,126	1,377	+ 251
,, United States	402	126	− 276

Exports.

	1927. Thous. fr.	1928. Thous. fr.	Inc. or dec. Thous. fr.
Dynamo-electric machines and electric transformers of all kinds—			
Total	28,444	36,364	+7,920
To Germany	2,479	2,489	+ 10
,, Austria	357	996	+ 639
,, France	1,638	1,495	− 143
,, Italy	1,540	1,657	+ 117
,, Belgium	620	1,756	+1,136
,, United Kingdom	853	518	− 335
,, Egypt	199	347	+ 148
,, Spain	4,256	7,397	+3,141
,, British India	219	60	− 159
,, Poland	811	3,243	+2,432
,, Rumania	900	880	− 20
,, Brazil	1,330	614	− 716
,, Argentina	757	1,136	+ 379
,, Netherlands	1,202	1,647	+ 445
,, Norway	308	444	+ 136
,, Netherlands Indies	1,030	836	− 194
,, China	411	253	− 158
,, Japan	2,295	2,908	+ 613
,, Peru	476	265	− 211
,, Australia	1,116	821	− 295
Accumulator batteries, electrodes in combination with rubber or celluloid—			
Total	254	434	+ 180
To France	34	46	+ 12
,, Italy	24	9	− 15
,, United Kingdom	7	35	+ 28
,, Spain	*	15	—
,, Argentina	*	261	—
Insulators, mounted—			
Total	129	64	− 65
To Italy	21	1	− 20
,, Spain	11	13	+ 2
,, United Kingdom	4	2	− 2
,, United States	50	4	− 46
Electric cable, not insulated—			
Total	2,042	2,284	+ 242
To France	815	313	− 502
,, Austria	127	201	+ 74
,, Italy	117	108	− 9
,, United Kingdom	644	1,058	+ 414
,, Czecho-Slovakia	113	189	+ 76
Cable, lead covered—			
Total	39	77	+ 38
To France	20	1	− 19
,, Spain	14	9	− 5
,, Poland	*	45	—
Cable, lead-covered and iron armoured—			
Total	26	104	+ 78
To France	15	*	—
,, Poland	*	95	—
Cable, insulated with rubber or paper and covered with textiles—			
Total	696	771	+ 75
To France	18	22	+ 4
,, Belgium	1	17	+ 16
,, United Kingdom	461	596	+ 135
,, Denmark	99	1	− 98
,, India	42	46	+ 4
Cables, ditto, covered with lead—			
Total	32	18	− 14
To Spain	27	2	− 25
Electric locomotives—			
Total	2,216	5,672	+3,456
To United Kingdom	19	28	+ 9
,, Venezuela	130	*	—
,, Spain	1,623	3,451	+1,828
,, India	403	1,372	+ 969

* Not specified.

	1927. Thous. fr.	1928. Thous. fr.	Inc. or dec. Thous. fr.
Telegraph and telephone apparatus—			
Total	959	1,812	+ 853
To France	120	204	+ 84
,, Italy	143	336	+ 193
,, Germany	144	47	− 97
,, Holland	*	501	—
,, United Kingdom	77	65	− 12
,, Belgium	51	50	− 1
,, Chile	*	424	—
,, Egypt	10	17	+ 7
Electric incandescent lamps, mounted—			
Total	2,994	2,579	− 415
To Austria	540	308	− 232
,, France	298	84	− 214
,, Italy	720	464	− 256
,, United Kingdom	28	32	+ 4
,, Holland	847	1,492	+ 645
Steam engines, cranes, pumps, turbines, &c.			
Total	14,535	17,298	+2,763
To Germany	835	2,182	+1,347
,, France	2,157	460	−1,697
,, Belgium	997	1,698	+ 701
,, Holland	544	853	+ 309
,, British India	210	644	+ 434
,, Japan	1,741	1,319	− 422
,, United Kingdom	931	1,531	+ 600
,, Spain	934	574	− 360
,, China	135	65	− 70
,, Argentina	262	79	− 183
,, Egypt	26	76	+ 50
,, Rumania	166	583	+ 417
,, Russia	175	570	+ 395
,, Portugal	205	276	+ 71
,, Colombia	68	15	− 53
Electric meters—			
Total	13,215	16,696	+3,481
To Germany	748	1,565	+ 817
,, Austria	483	741	+ 258
,, France	1,963	2,192	+ 229
,, Italy	642	470	− 172
,, United Kingdom	1,648	1,649	+ 1
,, Belgium	1,266	1,386	+ 120
,, Spain	1,039	1,299	+ 260
,, Japan	456	680	+ 224
,, Netherlands	603	672	+ 69
,, Czecho-Slovakia	1,049	1,412	+ 363
,, Australia	288	594	+ 306
,, United States	756	637	− 119
Electrical apparatus not elsewhere mentioned—			
Total	14,321	13,824	− 497
To Germany	1,067	1,099	+ 32
,, Austria	516	437	− 79
,, France	1,488	1,608	+ 120
,, Italy	573	906	+ 333
,, Belgium	1,380	579	− 801
,, Netherlands	675	1,057	+ 382
,, United Kingdom	749	614	− 135
,, Spain	2,159	2,839	+ 680
,, Portugal	275	255	− 20
,, Norway	119	300	+ 181
,, Czecho-Slovakia	721	436	− 285
,, Egypt	232	227	− 5
,, China	82	49	− 33
,, Japan	411	254	− 157
,, United States	1,364	159	−1,205
,, Argentina	400	467	+ 67
,, Peru	105	52	− 53
,, Rumania	211	187	− 24
,, Poland	224	944	+ 720

* Not specified.

Trade of British Malaya.

The Need for Alert Representation.

THE importance of British Malaya should not be gauged solely by its present commerce; its strategic position as regards trade with China, Japan, India, Australia, and New Zealand is becoming of increasing value. This view is expressed by Mr. L. B. Beale, C.B.E., H.M. Trade Commissioner, in a review of the trade of British Malaya during 1928 prepared for the Department of Overseas Trade. (Stationery Office, 3s. net.)

This country, which is about the size of England, is the pivotal point of Far Eastern ocean communication. It produces almost half the rubber and over a third of the tin of the world, and its economic and trading activities are dominated to a little-realised extent by the Chinese. British Malaya is the testing ground of British commercial strength in the Middle East. If the United Kingdom can secure and hold a substantial share of the country's trade, her future trade position throughout that part of the world is largely assured.

Mr. Beale considers that at present the United Kingdom is not keeping pace with competitors. Malaya imports annually some £40,000,000 worth of manufactured goods; before the war the British share was almost half, but now it is less than a third. Japanese and Continental manufacturers are more active in several directions, more painstaking, and more intimate with the market. There are exceptions, among them being machinery and electrical apparatus. It is thought that British trade could be increased considerably if more attention was paid to the market. The population is practically wholly Asiatic, but the standard of living—for Asiatics—is high.

Electrical Trade.

In a list of imports during 1927 electrical goods and apparatus are shown at $5,443,727 (£635,000), or 1.5 per cent. of the total. Machinery imports were valued at $22,899,533 (£2,672,000), representing 6.2 per cent. of the total. In the first six months of 1928 the respective values were $3,986,162 (£465,000) and $14,557,047 (£1,700,000). The bulk of these goods were supplied by the United Kingdom. In the case of electrical goods and apparatus this country's share amounted to 71 per cent. of the 1927 total and 75 per cent. for the first six months of 1928. In the two periods the United States was credited with 18 per cent. and 16 per cent., respectively, and Europe with 7 per cent. and 6 per cent. The United Kingdom share of this valuable and rapidly increasing trade is most satisfactory, taken as a whole. British interests are generally in the hands of strong and capable distributors, assisted in many lines by the manufacturers' specialists resident on the spot. Mr. Beale says that if British trade interests in Malaya generally were as well looked after as they are in the electrical and machinery sections, the United Kingdom would make a much better showing. The attention of the writer was called on more than one occasion by British merchant firms in Singapore (dealing in electrical apparatus) to the difficulty of securing efficient, hard-working young British engineers.

The principal item in the electrical class is insulated wires and cables; in 1927 over 96 per cent. was credited to this country, while the remainder was supplied by Germany, Japan and the United States. Several British cable manufacturers are capably represented on the spot by specialists who keep in close touch with every requirement of public and private work. A similar position is recorded with regard to telegraph and telephone instruments and apparatus; of this class 98 per cent. came from the United Kingdom. With regard to electric lamp imports it appears that this country secures between a third and a half of the trade, Japan being very active in this direction. The United States supplied 70 per cent. of the greatly increased imports of batteries and accumulators in 1927, while the United Kingdom provided only 17 per cent. American success is attributed to the presence of capable distributors and the rendering of efficient service, two points to which British makers might pay attention. With regard to unspecified apparatus, the heavier equipment is supplied mainly by the United Kingdom and the smaller and lighter lines by the United States. With the more general use of electricity a good trade in household electric refrigerators, cooking apparatus and heating units has arisen, much of which is secured by the United States. American electrical plant is also found on dredgers, &c., of American-owned tin-mining plants. The share secured by Italy includes three and four-blade electric ceiling fans. It is reported that Italian makers provide adjustable fan blades—a desirable feature—whereas most British fans are supplied with fixed blades. The United Kingdom will only continue to hold her share of the considerable and growing trade under this heading by stricter attention and an ability to supply household electrical requirements. The imports of electric lighting fittings are increasing, and the United Kingdom secures nearly 70 per cent. of the trade. British fittings are preferred, and are likely to retain their hold upon the market.

Imports of electric generators were valued at $43,183 (about £5,000) in 1925 and $128,238 (£15,000) in 1927; in the latter year the United Kingdom supplied 91 per cent., and the United States lost the small share which it held in 1925. The imports of electric motors amounted to $408,919 (£47,700) in 1926, and $357,153 (£41,700) in 1927. The British share fell from 84.6 to 70.5 per cent., while that of the United States increased from 7.5 to 10.8 per cent., and Germany's from 1.4 to 9.0 per cent. Most of the large motors came from Great Britain, but the United States and Germany had a good share of the small motor trade. In 1927 the imports of unenumerated electrical machinery had a value of $1,418,771 (£165,500), of which the United Kingdom supplied 70 per cent.

Trading Methods.

The report says that at some stage in almost every sale of imported goods the Chinese trading element enters (except to Government and public bodies and to a moderate extent to local Indian dealers, who import direct), and the tendency of competing countries is to encourage and develop direct importation by Chinese and other Asiatic dealers without using the local European merchant house as much as formerly.

This method of trading necessitates the presence on the spot of someone who represents the manufacturer and has his interests at heart. The United Kingdom needs more intelligent hard-working specialist representatives who are willing and able to investigate requirements, combing every channel of trade and keeping their principals fully informed. British Malaya is the centre of a number of valuable markets—Dutch East Indies, Siam and French Indo-China—and the right repre sentative with headquarters at, say, Singapore, could work with the British manufacturers' merchant agents in all the markets named. There are several British firms—particularly those dealing in iron and steel and manufactures thereof, machinery, electrical apparatus, tires, cables and several other lines—who conduct business in a first-class manner to their own great advantage and that of their United Kingdom principals. But after making full allowance for the effective work of such firms the menace of slack methods of doing business most certainly does exist. In general merchandise the United Kingdom is not so well served as her competitors, although, as previously pointed out, the fault lies largely with the United Kingdom manufacturers themselves. The trade of British Malaya is extraordinarily competitive, and we need to use all our skill and intelligent energy if we are to secure and hold our share.

The Institution of Mechanical Engineers.

A brief account of the Summer Meeting at Manchester, more particularly of a visit to the works of the Metropolitan-Vickers Electrical Co., Ltd.

THE summer meeting of the Institution of Mechanical Engineers at Manchester (June 25th to 28th) was the largest it has ever organised, the number of members and guests who took part in it being estimated at 900 at least. The meeting opened in exceptionally fine weather, and the many visits to engineering works and other places of interest in the neighbourhood took place under pleasant conditions.

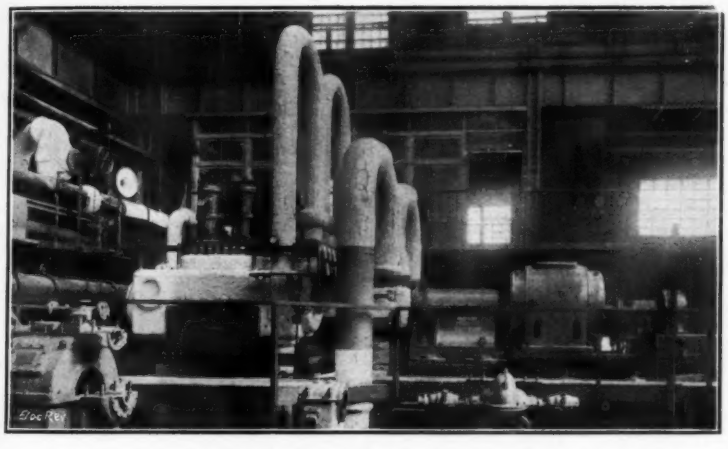


Fig. 1.—A Very-high-pressure Turbine on the Test Bed.

At the School of Technology the Lord Mayor welcomed members to the city, and Mr. D. Adamson (president) responded.

Papers Presented.

Mr. R. W. Bailey (Metro.-Vickers Co.) read a paper in abstract in which he drew attention to the contribution of Manchester researches to mechanical science. During the discussion Dr. A. P. M. Fleming suggested that professors should compel their students to study the work of great pioneer investigators by means of examinations on their writings.

The other papers submitted included one by Mr. R. Livingstone on steam-turbine vacuum corrections, while Prof. H. L. Callendar dealt with extended steam tables,* being a report (ref. J/T40) from the British Electrical and Allied Industries Research Association.

The Metro.-Vickers Works.

Of the works visited by far the largest attended were those of the Metropolitan-Vickers Electrical Co., Ltd., at Trafford Park. Following a morning tour of the works, over 400 persons sat down to luncheon, presided over by Sir Philip Nash. In his speech of welcome Sir Philip mentioned that the company found fully half of its business outside Great Britain; it had a connection which was world wide. Last year it supplied plant to more than 22 different countries of the world, and in that way probably had to deal with 15 different currencies and many forms of Government; what was probably more difficult was the fact that it dealt with more than 22 different mentalities. The average size, in money value, of the orders it received, the average size of the individual order which the company accepted, was £115. They had seen that day plant representing contracts running into hundreds of thousands, but the fact was that the average size of the individual order which the company executed was not more than £115, so if the organisation looked elaborate they should remember that the company had to deal with something like 27,000 or 30,000 individual orders a year, and it required organisation to get that number efficiently executed.

Mr. Daniel Adamson, president of the Institution, thanked Sir Philip Nash, particularly on behalf of the ladies of the party, for whose benefit an exhibition of domestic appliances had been arranged. The progress of the company had been interesting; the works were an example of American enthusiasm and optimism at the beginning, backed up later and successfully by British management, and brought to a successful issue. It was now a very large and prosperous company, employing there about 12,000 hands and altogether about 30,000 people. There was a great variety of work; generators costing perhaps £30,000 or £40,000, and wireless sets costing a few shillings, figures that accounted for the average which Sir Philip had mentioned.

Special Plant.

Reference was made to various outstanding contracts, including that for the Central Argentine Railway, and to the second turbine for Imperial Chemical Industries, Ltd., which is shown in fig. 1, and is to form part of the power station equipment of the large chemical works now under construction for Synthetic Ammonia & Nitrates, Ltd., one of the Imperial Chemical Co.'s subsidiaries. The contract covers eight turbo-alternator sets, totalling over 80,000 kW capacity, and is said to be one of the largest for power plant ever placed in this country. More than half the total steam generated will be used for manufacturing process work, after

Fig. 2.—Part of E.H.P. Transformer Laboratory; 1,000,000 Volts.

* See ELEC. REV., May 10th, 1929, p. 835.

having first passed through the high-pressure turbines. The eight turbo-alternators are all to generate at 6,300 volts, three phase, 40 cycles, 2,400 r.p.m., and are to be arranged as follows: three 12,500-kW, m.c.r., primary sets; two 12,500-kW, m.c.r., condensing sets; and three 6,000-kW, m.c.r., feed-heating sets. Two sets in each group will be working when the station is on full load, the other sets in the first and third groups being used as stand-by. The primary turbines will be designed for operation by steam at a stop-valve pressure

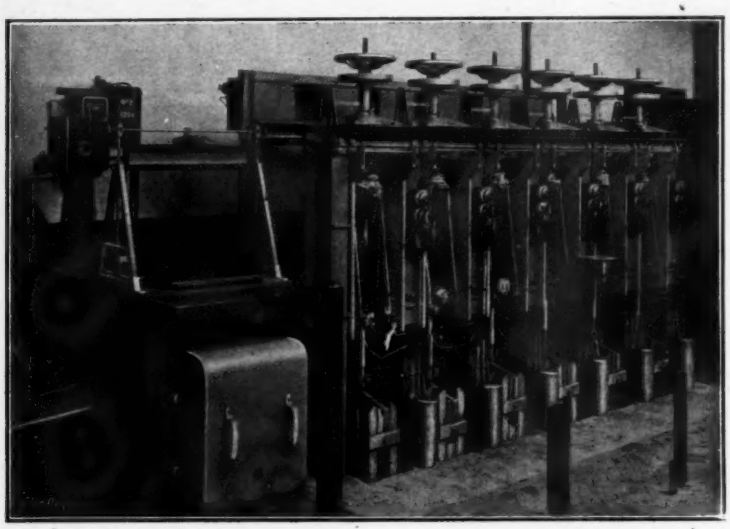


Fig. 3.—Test Equipment for "Creep" of Metals at High Temperature.

of 630 lb./sq. in. gauge, superheated to a total temperature of 833 deg. F. The alternators will be of standard "Metrovick" design. The five larger units will have a capacity of 15,625 kVA, and the three smaller sets a capacity of 7,500 kVA. The patent closed-circuit air-cooling system will be used for ventilating the generators.

The visitors were impressed by the amount of work in hand in all sections of the works. The company has recently extended its high-voltage laboratory, which is now equipped with two 500,000-volt transformers (fig. 2) with provision for their connection in series to give 1,000,000 volts. There is among the equipment an impulse generator for one million volts to test out-door apparatus for its performance under lightning conditions. An interesting example of the many items of special equipment designed and constructed by the Research Department for measurements of precision in connection with investigational work is illustrated in fig. 3. The apparatus is used for the measurement of the elongation, or "creep," of metals under conditions of high temperature and high stress. Independent tests can be made simultaneously of up to six specimens of material in any desired combination of stress, temperature, and surrounding media.

In touring the works the increasing use of electric welding was a very prominent feature.

New Switchgear Assembly Shop.

Although the main factory, with a floor space of about 35 acres, was one of the largest in the country, increasing business made it necessary to add a large new building for the final stages of the manufacture of switchgear of the metal-clad and outdoor types, including large high-voltage oil circuit breakers. The new shop is supplementary to the older works switchgear departments, which, including the main aisle 900 feet in length, are still devoted entirely to switchgear manufacture. It consists of a single-storey open-type shop, 420 feet in length and 220 feet in width, with provision for extension and the rapid assembly of standardised units, and for testing all kinds of apparatus at the place where it is assembled in the shop, thus obviating the trouble and delay of moving equipment in and out of a test area. Electricity for testing, even at the highest voltages, is available over the assembly area, and portable interlocking screens are provided for the safety of operators and other workers. The equipment includes a 500,000-volt testing transformer (fig. 4) and Schering bridge equipment for measuring the energy losses in insulation at working pressures up to 300,000 volts. The latter equipment has been constructed by the company, and is the only one of its kind built or installed in this country, and probably the first in the world to be installed for use at so high a voltage.

The roof lights, together with large windows in the north wall, provide effective natural light. The floor is of reinforced concrete faced with a special variety of red brick, which does not crumble and thus does not produce dust, an important feature in a factory where processes of insulation for high voltages are carried on; new roads which serve the building are also of reinforced concrete, and railway communication has also been provided.

The heating and ventilation system circulates the air at the rate of 1.61 changes per hour, and has a steam heating capacity of 4,690,000 B.th.u. per hour. Apart from considerations of comfort of the workers, the maintenance of a steady temperature is of importance in preventing the condensation of moisture upon the insulation and other parts of apparatus under construction. The artificial lighting is of a high standard; the installation includes 30 lamps of 1,000 watts each in concentrating reflectors, mounted 40 ft. from the floor; and 92 lamps of 500 watts each in angle reflectors, mounted 16 ft. from the floor.

Fig. 5 shows one of the features of the equipment introduced to facilitate the work of assembly, namely, the use of plates let into the floor in such positions that they serve as temporary mounting bases for the assembly of switchgear with different sizes of supporting frames. Fig. 6 is a general view of the area in which circuit-breakers of the outdoor type are assembled. The units seen in this illustration are a small part of orders for 132,000-volt and 115,000-volt gear for the British "grid" and for transmission systems abroad. Over 500 large high-voltage circuit-breakers, similar to the type illustrated, have now been supplied, or are on order, from the Metropolitan-Vickers Company.

The assembly bays are served by seven travelling cranes, ranging from 2 to 10 tons capacity, while the north-end bay is traversed by a 25-ton travelling crane and has a small jib crane in the test area; all equipped with motors, control gear, and protective panels of "Metrovick" manufacture.

The storeroom in which all bushings, bakelite, and other insulating materials, are stored until they are required for use, in order to prevent the deterioration which might result from moisture condensing on the materials, is maintained at a temperature of from 15 to 20 deg. F. above the atmospheric temperature. Adjoining are two drying ovens: one is 12 ft. high, 7½ ft. wide, and 14 ft. deep, and the other 7½ ft. high, 11½ ft. wide, and 14 ft. deep. The former is used in conjunction with the assembly of porcelain rainsheds on high-

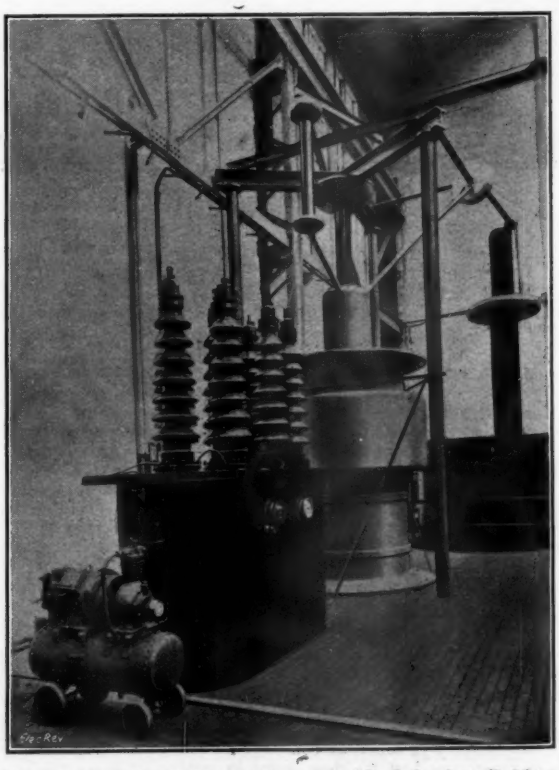


Fig. 4.—A 500-kV Transformer, with Schering Bridge Condenser and (foreground) 132-kV Condenser Terminal Bushings under Test.

voltage condenser bushings. The porcelain undergoes preliminary drying before assembly, and the rainsheds on assembled terminals are submitted to prolonged drying before compounding. The latter oven finds its chief application in the drying of castings before compound filling in the case of the higher-voltage metal-clad switchgear, and also for a large quantity of miscellaneous work. Both the ovens are of the company's own industrial electrically-heated type.

To facilitate the melting and pouring of the bitumen compound which is used extensively in metal-clad gear, two boilers have been fitted with motor-driven stirring paddles to prevent excessive local heating of the material; most of the filling is done direct from the boilers, but for operations in other parts of the shop the compound can be conveyed in a crane ladle. As most of the machining operations are done in the main shops, the new machine-tool section is limited in extent.

Power is delivered to the building by means of a 6,600-volt feeder which has been laid from the main works sub-station to an outdoor weatherproof transformer mounted, with isolating switches, in an enclosure of expanded-metal screen work. The transformer is of 625 kVA capacity, giving its output at 440 volts, 3-phase, 50 cycles, for general use. The new indoor sub-station equipment includes a motor-generator set consisting of a 6,600-volt synchronous induction motor driving a 500/250-volt d.c. generator, which supplies a 3-wire system for the variable-speed motor drives and for testing purposes.

Fig. 5.—Metal-clad Switchgear Assembly Shop.

The arrangements for testing are interesting, and provide unusually high voltage for the testing operations of a manufacturing department. Apart from the transformer and Schering bridge, however, an important new principle has been introduced: in place of the usual practice of moving finished apparatus into a test area, the requisite supplies are made available throughout the assembly areas. The principle has been extended even to the supply at 500,000 volts, involving the design of a half-million-volt bus-bar, which itself is believed to be unique in switchgear factory equipment.

The 500,000-volt transformer is seen on the extreme right of fig. 4, which shows also, in the centre, the large air condenser for the Schering bridge equipment, and on the left, an oil tank with condenser type bushings mounted for test, and an oil-circulating pump. Another oil tank, 18 ft. in length, provides for tests on high-voltage terminals completely immersed in oil; the oil tanks are fitted with automatic temperature control. The supply to the transformer, which has a ratio of 1,000/500,000 volts, is provided by a motor-generator set housed in an adjoining annexe, the voltage being regulated by means of a motor-operated rheostat in the alternator exciter field, the alternator giving a true sine-wave voltage curve at varying frequencies. The complete control of operation, whether of the transformer alone, or with the Schering bridge equipment, is effected by means of push buttons from a desk on a gallery, which commands a view of the whole of the test equipment and the area into which the high-voltage supply is extended. The equipment of the control desk includes a crest voltmeter which gives direct indication. Provision is made for the production of artificial rain, and the high voltage is carried over the assembly area for outdoor gear by means of a collapsible bus-bar running from the transformer throughout the length of the erection bays. The supports are bakelite tubes, compound filled and shielded from brush discharge by aluminium spinnings carried on the bus-bar. When not in use the bus-bar is lowered into a convenient position close to the stanchions, so as not to interfere with the passage and working of the cranes. The raising and lowering gear is operated by a motor with worm reduction gear, controlled from the control gallery of the high-voltage test equipment. When the bus-bar is in its raised position the cranes in both the eastern and northern aisles must be kept outside the test zone; this is ensured by trip switches on the crane runways, which cut off the power supply to the cranes and the excitation feeding the bus-bar, in the event of a crane over-running the set limit. The safety of operators and other people who may be in the vicinity of apparatus under high-voltage test is further ensured by the use of electrically-interlocked portable screens, which are arranged to enclose the area affected.

For tests at from 2,000 to 120,000 volts, a number of portable equipments are provided. The largest comprises a 440/120,000-volt, 50-kVA, transformer with an induction regulator and control panel with a crest voltmeter, which form a separate portable unit. Other equipments provide a.c. testing supplies up to 35,000 volts, 10,000 volts, and 2,000 volts, respectively; also control desks fitted with regulating switches and contactor gear by means of which any commercial range of d.c. closing voltages and a.c. or d.c. tripping voltages can be obtained. A comprehensive range of low-voltages for testing purposes is also made available in the assembly area, distribution being effected by a plug-type switchboard located beside the control board in the motor-generator annexe, in conjunction with a system of low-voltage bus-bars run in trenches along the erection bays; tapping points on the bus-bars are taken through ironclad switches mounted on the stanchions. Close to each tapping is a pipe connection with oil under pressure for filling circuit-breaker tanks quickly by means of flexible pipes, and as the motor-driven oil pump is reversible, the same connections can be used for pumping the oil back to the storage tanks. The entire testing equipment has been designed to facilitate rapid handling when making tests, and the saving of time thus effected will be appreciated by inspecting engineers.

For the whole of the work of preparation, construction, and equipment of the building the Metropolitan-Vickers Electrical Co., Ltd., acted as main contractor on its own behalf, the sections of the work being carried out by various firms specialising in the particular lines of building construction and equipment. A notable feat of organisation was constituted inasmuch as the time which elapsed between the taking over of the site and the handing over of the building fully equipped for production was only fourteen months.

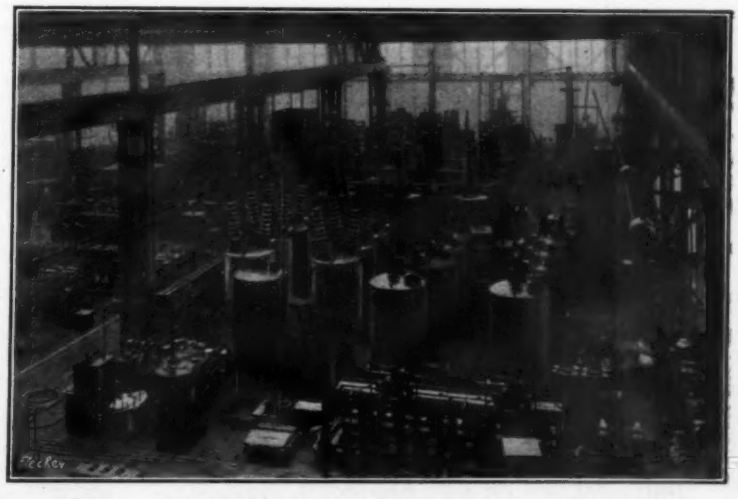


Fig. 6.—High-voltage Oil Circuit-breaker Assembly Bay.

The Whitworth Society.

The summer meeting of this Society was held in Manchester during the summer meeting of the Institution of Mechanical Engineers. A donation from the Whitworth Society of £25 in favour of the Manchester College of Technology was handed, along with a copy of "The Whitworth Book," to the Lord Mayor of Manchester by Mr. Daniel Adamson, president of the Institution of Mechanical Engineers. The donation is to be disbursed in the form of prizes to students who intend to compete for Whitworth scholarships and the Society hopes to make similar donations to other technical colleges in future years. The dinner was held at the Engineers' Club, the chair being taken by the president, Mr. Fred. H. Livens (Wh.Sc. 1874), who inducted into office the new president, Mr. William H. Fowler (Wh.Sc. 1873) of Manchester.

A Shipbuilders' Joint Meeting.

A Brief Account of a Summer Meeting held at Newcastle-upon-Tyne.

A JOINT summer meeting of the North-East Coast Institution of Engineers and Shipbuilders and of the Institution of Engineers and Shipbuilders in Scotland took place at Newcastle-upon-Tyne from July 2nd to 4th. The proceedings commenced at Armstrong College, under the chairmanship of Sir Charles A. Parsons, with an address of welcome by the Lord Mayor. The programme of events was an attractive one: it included visits to, and a civic luncheon at, the North-East Coast Exhibition, an Institution banquet and dance, a civic reception and dance, excursions to places of interest in the neighbourhood, and both official and informal visits to numerous works in the district.

Papers were read and discussed each day in the College. Amongst them was a paper by the chairman and managing director of the Newcastle-upon-Tyne Electric Supply Co., Ltd., extracts from which are reproduced below:—

Development in the Uses of Electricity.

(Abstract.)

By R. P. Sloan, C.B.E., M.I.E.E.

The electrical energy supplied direct by the North-East Coast power companies in their own areas in the year 1920 represented 230 units per head of population (against the average for the country of 82); 313 in the year 1926 (against the average for the country of 133), and 419 last year.

Motive Power.

The motors and other apparatus in shipyards and engineering works connected to the system at the present time represent 188,000 h.p., and the average consumption of electricity in merchant shipbuilding yards represents 48 units per ton of shipping launched.

One particularly interesting field of development has been in connection with coking collieries and iron and steel works. It has been found that in nearly all cases where waste products existed there was, at some period of the 24 hours, a considerable surplus over and above that necessary to provide the particular industry's power requirements, and, there being no profitable means of utilising this surplus, large quantities of energy were lost.

By co-operation with the local power companies, it was possible to make use of the whole of this waste, by the establishment of comparatively small and simple types of generating stations at individual works, which convert the whole of the waste products into electricity—the works taking what they require for their own purposes, and the balance being pumped

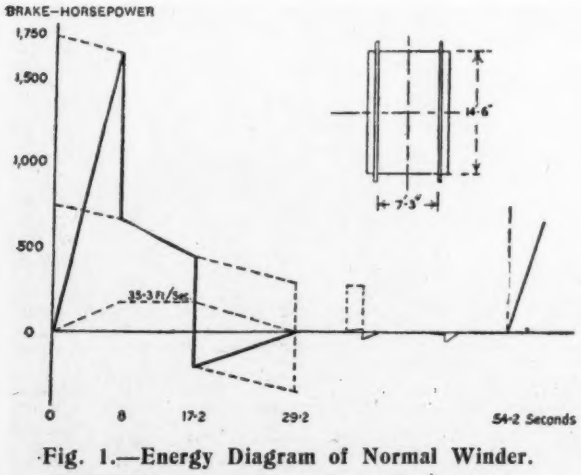


Fig. 1.—Energy Diagram of Normal Winder. Duty = 200 tons per hour from 676 ft. depth.

into the power supply system for general distribution. By this means the local power companies make use of waste products equivalent in thermal value to some 150,000 tons of coal per annum.

In the iron and steel works within the district it is estimated that 100,000 h.p. is connected to the companies' system. In one of these works (Messrs. Dorman, Long & Co.) is a motor capable of developing 20,000 h.p. This motor, which is, I believe, the largest in the country, operates a plate-rolling mill, which handles plates up to 42 in. in width and 2 in. in thickness.

In collieries in Northumberland and Durham, electrical energy is now being used to the extent of some 350 million units per annum, or about 7 units per ton of coal raised, but if all the pits in these coalfields were electrically equipped

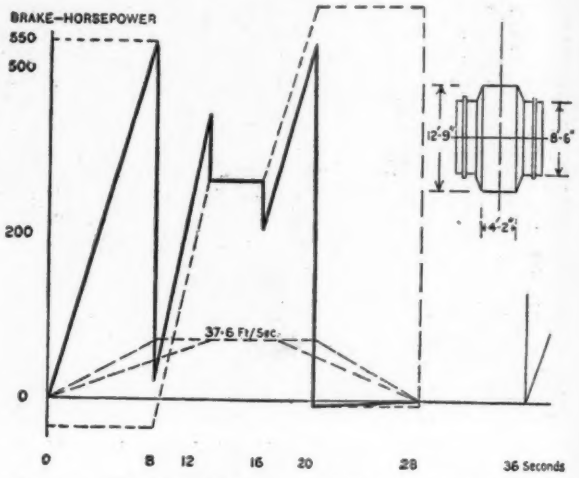


Fig. 2.—Energy Diagram of Winder with Modified Clutch Profile and Shaft Equipment. Duty = 200 tons per hour from 676 ft. depth.

throughout the average consumption would amount to 12 units per ton raised.

Fig. 1 shows a winder diagram which is frequently met with in practice, and illustrates the point I wish to emphasise.

It will be seen that the "peak load" at the moment of starting is about 1,700 h.p., and that this load is maintained for about eight seconds during acceleration, after which it falls rapidly to 700 h.p.

With the introduction of power supply from public mains, it became possible for colliery winders of simple and less costly design to be supplied with power, without disturbing the balance of the supply system, owing to the margin of power which could be drawn upon and to the diversity curve of the load over a large system. The aggregate continuous electrical rating of winder motors connected to the mains of the power companies is over 25,000 h.p., while the maximum torques exerted by these motors, for short periods, exceeds 50,000 h.p.

In one recent case where a 900-h.p. motor would be required to meet the existing winding conditions, it was found that, if judicious alterations were made to the drum profile and to the shaft equipment, the same hourly duty could be carried out by a 400-h.p. motor, thereby reducing the peak torque of the energy diagram from 1,750 h.p. to 600 h.p., with the result that the total winding cost could be substantially reduced.

A comparison of figs. 1 and 2 may be interesting in this connection, as the winders in the case of both these energy diagrams were designed to raise precisely the same hourly tonnage from the same shaft depth.

Industrial Heating.

The use of electricity for industrial heating purposes is perhaps one of the most likely directions in which development will take place.

In practice, the single factor of efficiency is frequently found to swing the balance of cost in favour of electric heating, but, quite apart from this advantage, if reduced labour costs, low maintenance charges and improved products, with less rejects, are taken into consideration, it is found that there is a wide range of heating processes which are more economical to work electrically than by any other means.

Rejects, in many processes, represent an appreciable item in the cost of production, as in the heat treatment of special alloys. I have been informed by a well-known manufacturer, who uses an electric furnace, having an output of 500 parts per day—costing approximately 1s. each—that rejects have been eliminated, although previous to the adoption of electric heating, due to uneven heating, they amounted to as much as 50 per cent.

Ease and exactness of temperature control (which may be automatic within 1 per cent.), cleanliness in operation, and absence of combustion gases are qualities of great value in electric heating apparatus, and heating elements now give satisfactory service at temperatures up to 1,350 deg. C.

Heat Treatment of Steel.—In one local works where an electric furnace is used for the heat treatment of steel, it is the practice to place 1¼ cwt. of steel parts in the furnace each afternoon before the works are closed. The furnace is started automatically at such a time during the night as permits of the steel being maintained at the required temperature for the necessary period, so that when the works open in the morning the "case hardening" process is completed. The output previously obtained with the furnace earlier in use has been doubled without increasing the cost of labour.

Carbon Steel Hardening.—For hardening carbon steel (as apart from high-speed-tool steel) an electric furnace has been developed by the use of which the critical quenching temperature for steels of varying grades is automatically indicated by a magnetic detector.

Underheating, with the resultant development of soft spots, and over-heating, which is followed by a coarsening of the grain and a consequent reduction in strength and durability, are avoided.

Traction.

Railway Electrification.—The electrification of the steam railways of this country made little progress prior to 1904, when the Tyneside lines of the North-Eastern Railway, the Southport lines of the Lancashire and Yorkshire Railway, and the suburban sections of the London, Brighton and South Coast Railway were changed to electrical operation. Further progress was arrested by the difficulty in deciding on a standard system of electrification. After the war, the North-Eastern Railway had practically decided to electrify its main line from Newcastle to York, but there came a check with the grouping of the railway companies. With a recovery in trade the raising of capital should not offer any real difficulty to railway electrification, particularly as the establishment of the National "Grid" should considerably reduce the amount of capital to be found by the railway companies, both on mains and generating stations. The increasing competition of road transport could better be met by the more frequent train services possible with electric traction.

Agriculture.

Until recent times the mains of the various electricity supply authorities have not been readily accessible in country districts, but this handicap is being rapidly overcome. To-day, over 29,000 sq. miles (with a population of five-and-a-half millions) out of a total of 51,840 sq. miles (with a population of seven and three-quarter millions) of the rural areas of England and Wales, are included within the areas of supply authorities.

In the year 1928, the number of farms which made use of these public supplies was approximately 1,700, and their average yearly consumption of electricity was about 1,052 units, although on a number of farms where electricity is used extensively the consumption exceeds 10,000 units per annum.

One conclusion arrived at in the conference convened by the Electricity Commissioners on "Electricity Supply in Rural Areas," from whose report these figures have been taken, is that the "realisable consumption" in the rural districts already within the supply authorities' areas is 230,000,000 units per annum. The areas referred to embrace no less than 409,383 farms, using 81,500 engines, totalling some 500,000 to 600,000 h.p.

Considerable losses are frequently suffered, due to the deterioration in hay and grain crop, because of wet weather being encountered during the period of natural drying. Electrical drying methods have been developed by the use of which it is claimed that hay of high quality can be produced without sunshine, thereby enabling the farmer to be independent of weather conditions during the time of harvesting. Published results of trials show that a 5-h.p. electric fan is of sufficient capacity to cure 100 tons of hay, during a period of two hours per day for nine days. The same plant may be used for curing grain.

Refrigeration, which is now so universally employed in the meat, fish and fruit trades, should prove of great benefit to farmers.

The application of electric power to ploughing and tilling has not been developed in this country to any extent. Where electric ploughing has been adopted, it has been found that the consumption of electricity amounts to approximately 20 units per acre. It is computed, however, that if electric power was also used for the various tillage processes which follow the ploughing operation, this consumption would be doubled. There are over 10,000,000 acres of arable land within the existing areas of the various supply authorities, and if 30 per cent. only of this area came under the plough each year, ploughing and subsequent tilling alone would provide a consumption of the order of 100,000,000 units per annum, which would be in addition to the figure of "realisable consumption" that I previously mentioned.

Tramways & Light Railways Association.

A Report of the Proceedings at the Nineteenth Annual Congress at Sheffield.

THE Tramways and Light Railways Association held its thirty-second annual meeting and nineteenth congress at Sheffield from July 3rd to 5th. On July 3rd there was an informal reception by the Chairman of the Council (Mr. C. J. Spencer) at the Grand Hotel, the headquarters of the Association.

On Thursday, July 4th, the LORD MAYOR OF SHEFFIELD (Ald. Harry Bolton), in giving a civic welcome, said there was no question that the tramways would be scrapped in Sheffield, but at the same time there was a field for motor 'buses.

Fig. 1.—Mr. G. H. Fletcher receives Congratulations.

Mr. P. B. BROWN (chairman of the Sheffield and District Manufacturers' Reception Committee, which entertained the Association at dinner and luncheon and generally arranged for visits to works, &c.) spoke of the dependence of transport upon Sheffield products, and pointed out how Sheffield industries were depressed at the moment. He recalled something of the early history of tramways and of Mr. A. L. C. Fell's association with the City, and gave the Association a hearty welcome in the name of the Sheffield manufacturers, many of whom had been members of the Association since its inception.

On Thursday, July 4th, the Association was entertained at dinner by the Sheffield and district manufacturers, Mr. P. B. Brown presiding.

Proposing "The Tramways and Light Railways Association," Mr. BROWN said the Sheffield steel trades were undergoing a somewhat trying experience. These industries were not sheltered, as was the industry represented by the Association, and it was impossible for the Sheffield manufacturers to improve their position by putting a penny on fares or increasing rates. Many people had said that the position of the trade in Sheffield and elsewhere would be improved by safeguarding, municipal control or nationalisation, but he would express no opinion as to that. They must wait and see, and he feared they should have to wait a long time. Nevertheless, he had every confidence that they would, in the steel and engineering trades, recover the position which they once held in the markets of the world, which had been damaged for the time being by the aftermath of the war.

Mr. C. J. SPENCER (chairman of the Council of the Tramways and Light Railways Association), responding to the toast, first expressed the great appreciation of the members of the Association of the hospitality that had been extended to them by the Sheffield and district manufacturers. It was very gratifying to see the manufacturers and the users coming together in this way, and it was a little to be regretted that there was not greater co-operation between the two tramway Associations, the Municipal Tramways and Transport Association and the Tramways and Light Railways Association. Surely the day was not far distant when it would be possible for the two Associations to be merged, or to meet together to discuss common problems. They were rather apt to stress their small differences and forget the 99.9 per cent. of things in which the interests of the two Associations were identical. There had already been a little co-ordination and co-operation between the two Associations, but he hoped that there would be a greater measure of co-ordination in the future. Mr. Brown had referred to the tramway industry as being a

sheltered industry, but he could assure him that it was subject to a great deal of competition and they certainly could put nothing on the rates or a penny on their fares. They were, however, looking forward to better things in the tramway and light railway world and he hoped that the evidence given before the Royal Commission on Transport would result in improving the position generally, and that the tramways of the country would have no longer to exist under legislation passed in the dark ages.

Mr. A. L. C. FELL, proposing "The City and Trade of Sheffield," said that tramways were in a more healthy position than they had been for a long time and that, given a chance of running under similar conditions to those enjoyed by other passenger-carrying vehicles, they were out and out the best means of transport for the vast multitudes that had to be carried in the large cities.

At the luncheon held at the Grand Hotel on Friday, at the invitation of the Sheffield and District Manufacturers, Mr. P. B. Brown presided. The only set toast was "The King," but Mr. BEXKETT proposed the health of Mr. A. de Turckheim, and expressed the gratitude felt by all for his unceasing work and his invariable cordiality in the affairs of the Congress. This toast having been carried with acclamation and musical honours, Mr. DE TURCKHEIM, in his acknowledgment, said that if anybody should be thanked it was Mr. Camm, the honorary secretary of the Sheffield Manufacturers Committee. Mr. SPENCER then thanked the hosts for the splendid entertainment and hospitality of the week, mentioning especially Mr. Brown and Mr. Camm; and Mr. BROWN, replying, said that he welcomed this opportunity of cementing friendship that had hitherto been more or less casual.

Arrangements were made to visit the following works:—(Thursday) English Steel Corporation, Ltd. (Cammell, Laird and Co., Ltd.), where the foundry—perhaps the most modern in this country—aroused great interest; Titan Trackwork Co., Ltd.; Hadfields, Ltd.; (Friday) Brown Bayleys Steel Works, Ltd.; Edgar Allen & Co., Ltd.; and Metropolitan-Vickers Electrical Co., Ltd.

On Friday evening a reception and dance at the Town Hall, given by the Lord Mayor and Lady Mayoress, provided a fitting conclusion to a most successful Congress.

Fig. 2.—Ald. Beardsley, Mr. Fearnley, and others at Cammell, Laird's.

Figs. 3 and 4.—Members Visiting the Titan Trackwork Co.

The Modern Tramcar.

By G. H FLETCHER, A.M.I.E.E. (*Abstract*).

The chief sources of noise in a tramcar are, firstly, those due to the impact of the unsprung weight upon the track, and, secondly, though not to the same extent, those due to gear meshing. Impact is due to change in velocity of a mass, and, in the case of a tramcar, the changes in velocity are due to irregularities in the track, such as points, joints, corrugations, crossings and rough rail.

There are two methods of reducing this impact: one is to reduce the weight of the wheel and axle and associated dead weight, and the other is to introduce resilience or yield in the components.

During the last ten years the weight of motor per h.p. has been reduced by at least 40 per cent.

There are three main forms of gear, *viz.*, spur, bevel and worm. The spur gear is the cheapest to manufacture and maintain. The worm is the most expensive to manufacture and maintain, but is extremely quiet in operation. The bevel gear is more expensive to manufacture than the spur, and requires careful maintenance in order to prevent the gears from becoming noisy. The only advantage of the bevel gear is that a right-angled drive is obtainable.

Stated briefly, the objectives in the majority of the recent developments have been:—

(1) To reduce the motor weight by increasing the motor speed.
(2) Dissociation of the inertia of the motor from the axle.
(3) To reduce the noise of the gears.

The worm gear, with the necessary couplings, &c., costs nearly as much as the motor itself, whereas in an ordinary tramcar drive the gears represent about 8 per cent. of the motor cost. This additional cost is not due to excessive cost of the worm and wheel, but to the expensive gear-case and cardan shaft assembly.

A design has been obtained which embodies all the good features of the worm drive, but which is more compact and less expensive, and in addition reduces the unsprung weight to an almost negligible amount so far as the motors and gears are concerned.

The motor, with its complete worm-gear unit carried in an extension of the motor casing, is supported from the main frame of the truck, and solidly bolted to it.

The worm wheel is mounted in a rotating hollow sleeve or quill, which surrounds the axle, but is quite free to move relatively to it by the amount of the movement on the axle springs.

The drive is transmitted from the hollow quill to the axle through a universal coupling, so devised that while the angular movements are solidly transmitted, there is complete freedom of relative movement in all other directions, both lateral and transverse.

Three journal bearings are used, one roller and two ball, and a quite separate ball thrust bearing is provided to take the thrust from the worm.

The worm is cut direct on an extension of the motor shaft, which is readily replaceable, as the armature is completely built on a sleeve.

Steps have been taken in the magnetic design to reduce the magnetic hum. The fan and air outlets have also been designed with the object of reducing windage noises.

The gear ratio is 9.6 : 1, giving a motor speed of 3,000 r.p.m., with a road speed of 30 m.p.h. and a 32-in. wheel. The gear efficiency is approximately 92 per cent.

The total weight of the whole drive, including motor, worm gear and universal coupling, is 1,570 lb. Only about 7½ per cent. of the total weight of the motor and gear is unsprung.

The weight of the motor and gear is only 31.5 lb. per h.p. on the 500-volt rating, and 25.2 lb. per h.p. on the 600-volt rating.

It may be economically sound to use comparatively expensive material if reduction in weight is effected, which could not be justified in the manufacture of stationary apparatus. Each cwt. of material in tramcars costs 14s. to 18s. per year for current consumption alone, neglecting the effect of the extra weight on the size and cost of the motor, and additional wear to tyre and track. This means that over an axle life of eight years the power saving alone works out at about £5 10s. per cwt.; a much smaller sum would pay for the additional cost of nickel-chromium-molybdenum alloy for the axles and the cost of machining out the bore.

Noise which originates at the gears is the chief drawback to the usual form of spur drive. A high note is more objectionable than a low one, even though the volume of sound may be less. The note is proportional to the number of tooth contacts per minute, increase in gear speeds and increase in motor speeds.

The reduction of gear noises resolves into two distinct problems. One is concerned with the generation and the other with the magnification of the noise. The noise may be caused by inaccurate pitch, inaccurate tooth form or roughened contact surfaces. For quiet gears pitch accuracy is absolutely essential.

Heavy oils are far preferable to greases for the lubrication of tramcar drives, and there are one or two oils on the market of such a viscosity that they can be retained in the gearcase without undue leakage. The gear centres should be maintained within reasonable limits, as otherwise contact due to the lack of parallelism between the armature shaft and axle may cause stresses beyond the elastic limit of the material and result in flaking or pitting.

Reduction in weight of body will affect the power consumption, but will not affect appreciably the impact between the rails and the wheels, except in so far as the reduced bending stresses on the axle due to this can enable the weight of the unsprung parts to be reduced.

We have tried experimentally magnesium alloy, which is known as Electron metal, for certain parts of the motor, and

after one year's operation the results have been quite satisfactory.

A few years ago the average schedule speed was eight miles per hour, and the speed of the car at the nominal rating of the motor ten miles per hour. The schedule speed is now as high as 10½ miles per hour, with a speed at the nominal rating of the motor of 15 miles per hour.

The characteristic curve of a motor most suitable for any service is one which is "steep," indicating little saturation and good acceleration.

The speed of the motor should be as high as possible, in order to reduce the weight and cost, and the maximum gear ratio should be adopted, but in cases where it is desired to modify the gear ratio for existing motors, the speed at the accelerating tractive effort should be very carefully considered. If the speed at this point is too high the starting current and power consumption are excessive, and there is a tendency for the driver to run on his resistance notches in traffic. On the other hand, the higher road speed at the accelerating tractive effort will enable higher schedule speeds to be met.

I would like to point out the fallacy of attaching too much importance to the one-hour rating; this may be increased by reducing the magnetic section of the yoke, which would give a higher speed at the one-hour rating, due to the saturation in the yoke reducing the flux of the armature core, but as the effect would be to flatten the characteristic curve, the current consumption for any schedule would be increased, and therefore, although the motor would have a higher nominal rating, it would actually give a higher temperature rise in service, owing to the higher current consumption. The two important factors are—continuous rating and shape of characteristic curve.

If car capacities and weights are increased, and much greater schedule speeds are required, motors of greater capacity will be necessary. Instead of increasing the motor weight, however, a better policy is to follow the railway practice of using Class B insulation, which will allow the motors to operate safely at considerably increased temperature rises.

Field weakening for increasing the balancing speed is used very seldom for tramway service. Theoretically a weak field position should give results somewhat similar to non-saturated motors, but for manual operation the best results are not usually obtained.

There are two methods of weakening the field; one is by taking a tap from the motor field, which cuts out a predetermined number of turns, and the other is to connect a shunt across the field. The first method is preferable, owing to the fact that a non-inductive resistance across the field produces a liability for the motor to flash-over.

The largest part of the energy taken is used in accelerating the car, and a large proportion of it is destroyed in braking. Attempts have often been made to transform the kinetic energy into electrical energy and to feed this back into the line. The difficulty is due to the fact that the regeneration must take place from a maximum speed to zero speed, and at the same time supply current against a constant line voltage.

The two latest schemes employ additional rotating apparatus, which transform the falling voltage from the main motors into a constant voltage. One method uses a double-commutator motor-generator with unequal voltage across each commutator.

Another scheme, developed by Della Riccia, uses a voltage potentiometer, which consists of two double-commutator armatures connected in series. The line voltage is applied across the four armature windings, and the motors connect across one pair only. The fields are energised in such a way that the voltage distributes itself unevenly between the various armature windings.

The advantage of this scheme is that the control is comparatively simple, an indefinite number of voltage steps can be used; in addition, there is no interruption of supply to the main motors, and therefore the acceleration is smooth. However, there is also in this case the disadvantage of the additional rotating apparatus, which is comparable in weight and cost with that of the first scheme described.

The saving in power consumption which might be expected by these systems of regeneration would be about 25 per cent., of which about 15 per cent. would be due to regenerated current and the remainder due to the reduced rheostatic losses.

When the wheels of a tramcar have a pure rolling motion over the rails, then the friction or adhesion between them is at a maximum. When, however, skidding takes place, the friction between wheel and rail falls to about half that value. It therefore follows that the most effective braking force on a wheel is that which is just insufficient to make it skid. No improvement upon this can be effected by the use of mechanical track shoes pressing directly upon the rail, since any braking applied to the track shoes causes a decrease in the effective adhesive weight of the car. Magnetic track brakes are free from this defect and are more effective than any other single form of track brake.

When the motors of a car are used as generators, the characteristic feature of the braking force is that if the wheel stops rotating the braking force also disappears until such time as the wheels are rotating again. Hence a temporary skid is automatically corrected and is relatively unimportant.

On the other hand, when the wheels of a car are braked mechanically by shoes on the wheels, the friction between wheel and shoe is "sliding friction," so long as the wheel is rotating, but becomes static when the wheel is stationary. The immediate effect of a skid, therefore, is roughly to double the co-effiecient of friction between the wheel and shoe, while at the same time halving the friction between the wheel and rail. This result is much more serious, since it is necessary, in order to restart the wheels rotating, that the braking force on the shoe be reduced at least to less than a quarter the maximum, which means a definite complete release and re-application of the brake on the part of the driver.

It is a generally admitted fact that the electro-magnetic brake gives far and away the most rapid stops, and it will be realised from the foregoing that it is actually impossible to obtain these high rates of retardation by means of any mechanically applied brake, whether of the track or wheel type. The most effective brake for emergency stops is therefore a combination of rheostatic and magnetic track brakes when properly adjusted.

The two well-known methods of connecting up the motors for rheostatic or magnetic braking are the crossed-field and parallel-field systems. With two motor equipments there is a danger with the crossed-field system of losing the braking effort entirely, by a single circuit fault such as a defective finger contact, while with the parallel-field arrangement two such faults are required to cause complete loss of braking effort.

On the other hand, the cross-field scheme has the decided advantage that normal operation of the controller-handle on the brake-notches will produce a braking effort on the car for either direction of motion, and this is of importance in the event of a car starting to run backwards on a steep hill.

With four motors arranged for half-line voltage per armature the braking combination can be arranged in two groups of two motors each, each group using the crossed-field scheme. This gives the run-back advantages of the crossed-field scheme, while braking effort cannot be lost, in either direction of motion, unless two circuit faults occur together.

Such a scheme as this gives practically all the possible safety features in one combination, but it means a considerable increase in the non arc-breaking portions of the controller.

The use of wheel brakes in place of track brakes will obviate rail wear, this being replaced by wear on the wheels and comparatively inexpensive wheel shoe-blocks.

Further advantages of the wheel brake are that it may be used when a car is running over crossings or junctions, and that the braking effect is more easily graduated. As against this, however, the track brake, owing to the larger area of contact, gives a better retarding effect than a wheel that is skidding, hence it is suitable for systems on which there are bad hills and frequent greasy-rail conditions.

The track brake is therefore necessary on bad hills, where it is essential that the speed should be kept down to 10 to 15 miles per hour, while the wheel brake is the most suitable for systems where high speeds, heavy traffic and frequent junctions are to be found.

Some form of electric brake (either rheostatic or magnetic or both) is fitted to all English cars, and frequently also a hand application of a mechanical track brake in addition to the usual hand brake acting on the wheels. Where an air brake is also incorporated it is very advisable that it should be arranged in such a manner as to be interlocked with the electric brake.

In America the majority of street cars equipped with direct hand-operated control have drum controllers protected by a magnetically-operated "line switch," arranged so that all destructive arcing is taken by the line-switch.

This scheme is not applicable to British practice for the following reasons:—

(*a*) The most destructive arcing takes place while "inching" in traffic.

(*b*) To make the line switch effective a considerable amount of idle movement of the controller-handle is necessary, such idle movement being employed to operate a pilot-switch in the control circuit of the line switch.

Such a scheme as that outlined above, necessitating 55 deg. of "slack," is obviously inapplicable to the majority of tramways in this country, where the whole circle of handle movement is occupied with power and brake notches.

Railway practice over a period of years has demonstrated very clearly that the contactor is the most effective means of rupturing heavy circuits at frequent intervals with the minimum effects of wear and burning.

The extension of the contactor principle to hand-operated controllers was a natural sequence and it is significant that since it was first put forward some years ago the principal manufacturers in this country have developed contactor-type controllers.

Contactors differ materially from drum and finger combinations in so far that the contactor has a definite and limited opening, and it is the more important, therefore, that the arc-extinguishing means should be powerful and efficient.

The speed of opening of a contactor has a marked influence in reducing the effect of arcs, even with a suitably powerful flux. Slow movement of the controller handle from the first notch to the "off" position may give rise to severe burning, and to overcome this a "quick-break" action would seem desirable. With a cam-operated contactor this can be accomplished by a very simple additional part.

In this country, where the double-deck car is popular, the four-motor equipment will not, in my opinion, become general.

The single-truck car gives 100 per cent. adhesion like the four-motor car. The former is cheaper and less destructive to the track, as there is less total dead weight per car, but on the other hand the riding qualities are generally not so good.

The most common bogie is still one or other of the various forms of maximum traction truck, sometimes improved by the incorporation of roller bearings. In this connection I might mention that it is claimed by some rolling-stock engineers that, as applied to four-wheel trucks, some improvement in preventing jazzing is effected by the use of roller bearings for the axle-boxes, due to the restricted end-play in the axles. It has also been stated that the use of helical gears, which has the effect also of restraining end-play in the axles, has the same result.

Discussion.

The CHAIRMAN said the paper was heartening to those who had preached in season and out of season the necessity for getting away from old methods in tramway equipment. It was clear from the paper that the manufacturers had really got away from the old methods to a modern and scientific manner of dealing with tramway problems.

Mr. G. N. CADBURY (West Bromwich) asked if the author could give any figures as to the difference in weight of the various types of drive described in the paper; for instance, the differences in weight between the four-motor equipment wholely sprung and the ordinary arrangement in which the weight was half sprung and half axle borne, and between the old 55-h.p. motor driving through spur gear and the more modern 55-h.p. high-speed motor driving through worm gear.

Mr. L. E. HARVEY (Ilford) regretted that the author had not gone into the question of brakes, as he had been experimenting with the "Tong" or disk brake, and that Col. Trench, of the Ministry of Transport, had carried out a test which gave a deceleration of something like 9 ft. per second per second, and there was no skidding of the wheels. The cost of this brake gear was somewhat high, but it paid for itself in about 2½ years because of the saving in brake blocks and a longer life for the tires. The surface of the tire was made harder by the rolling motion on the rail.

Mr. W. VANE MORLAND (Walsall) asked if there was any information which would indicate if the impact between the worm and the wheel would have any detrimental effect or whether special stresses were set up, as that point would determine whether the worm gear would survive for tramway purposes. He suggested that the limits of acceleration and deceleration, from the point of view of the comfort of the passenger, had been reached on tramcars. He contended that so far as gear hardening was concerned our manufacturers led the way. This he had proved by experiments between cars having gears made by British and foreign firms. The English gears at the end of six years showed very little signs of wear.

Mr. W. W. ADAM (London) stated that the Breda regenerative control system was in use on the Milan and Rome tramways with great success, despite many hills in the latter town. There was a saving of 30 per cent. in current consumption. On the Milan tramways they had not changed the brake blocks for more than six years, and he believed the system would soon be largely adopted in this country. The cost of manufacturing the apparatus here, however, would be some 25 or 30 per cent. greater than in Italy, but this extra cost would be repaid within six to eight months in the case of many systems here and in two to three years in the worst cases.

Mr. L. B. HEWITT (Metropolitan Electric Tramways) referred to the mention of field shunting in the paper as a means of increasing the maximum speed, but it was as effective in increasing the output as increasing the speed and it warranted close attention from that point of view. Field shunting would also help if consideration was given to it from the point of view of the generating characteristic of the motor as well as from the point of view of its motoring characteristics. In too many cases motors were all right on the power side, but they were by no means right on the braking side. The author had said that line switch control was impracticable in this country, but he did not see why. His company had 130 cars so fitted in London and was adding to them because they worked so satisfactorily.

Col. S. E. SMITH (Bristol Tramways & Carriage Co.) remarked on the fact that that was the first time—with the one exception of a paper on trackwork—that a manufacturer had read a paper before the Association and it was a really comprehensive paper on tramcars. A number of experiments were being carried out by manufacturers, the whole object of which was to make the tramcar cheaper to run or more inviting to ride in. The general tendency, however, was to make the tramcar more expensive to run because tramcars now were very complicated compared with the perhaps crude but simple and easily maintained tramcar of the early days. Therefore it seemed necessary to carry more passengers to make tramcars profitable. The one point in which the modern tramcar did not compare favourably with the motor 'bus was in regard to the low platform height. It would be necessary to reduce the height of the motors, and perhaps that could be done by adopting high-speed motors which would allow of a big reduction between the axle and the motor. In that case worm gear as at present designed would be impracticable and a double reduction as well as worm gearing would have to be adopted.

Mr. CADBURY, referring to Mr. Harvey's figures of deceleration of 9 ft. per second per second, said he was always under the impression that 5 ft. per second per second was the maximum available through the wheels only.

Mr. HARVEY said the figure of 9 ft. was shown by Col. Trench's instrument and the test was carried out by Col. Trench himself.

Mr. HEWITT mentioned the suggestion that braking systems should allow the motors to stand up to the stresses and contended that the equipment should be designed to stand up to the necessary braking.

Mr. R. FEARNLEY (Southend-on-Sea) also asked for further information concerning the figure of deceleration mentioned by Mr. Harvey.

The CHAIRMAN said he could speak somewhat in confirmation of that, as he had taken part in a test by Col. Trench when the deceleration was such that the inspector was butted into him (the chairman) and they both finished on the floor. At the end of it all Col. Trench said the figure was "only 8 ft."

Mr. W. V. EDWARDS (Hastings) said that he had gone over from tramways to the trackless trolley vehicle and when making a start with the new equipment he had wanted to stick to the series-parallel control. He was, however, persuaded to go in for single motor control and had been astonished how satisfactory it had proved. The losses with the single motor control were much less than with the series-parallel control, apparently because the series resistance was cut out.

Mr. R. B. HOLT (London) said the method adopted in Sheffield for eliminating vibration was a very good one, although not really original. The point in track construction was to avoid introducing anchors in resilient forms of construction because each anchor was a centre for vibration. Another necessity was to avoid joints and any form of welded joint was better than a mechanical joint.

Mr. D. SHAW (Permanent Way Department, Sheffield) regretted the absence of Mr. Hadfield, the city surveyor, who had been responsible for the latest form of track construction, and said that five miles of track was being constructed on this system every year. Not only did it reduce vibration, but it also reduced corrugation of the rails almost to nil.

The CHAIRMAN said that years ago when he was in Bradford it was found, on one in nine gradients, that the wear on the up track—using soft-iron shoes on a track brake—was double the wear on the down track, notwithstanding that there was constant braking on the latter. Moreover, with soft-iron shoes, it was found that the brake shoes wore and the rail did not. With magnetic brakes special steel was used for the brake shoes and the wear of the rails was one of the bugbears. Their aim was to obtain some metal which would wear itself instead of the rail. Flexible tracks had been used in London for many years and the result had been a great quietening of the cars. The latest light-weight modern tramcar was the quietest vehicle on the road and the only noise was the noise of the wheel on the rail. Gear noises had been cured and what had to be dealt with was the question of unsprung weight, in order to reduce the noise of the wheel on the rail. Flexible packing was a move in that direction. He did not think they had heard the last of regenerative control and with regard to the question of cost, mentioned by Col. Smith, he agreed that this must be kept as low as possible, although they could not expect to get all these improvements for nothing. Regenerative equipments would reduce current consumption and thus would automatically get rid of some of the alleged electrolysis trouble. One point about regenerative control was that it seemed to reduce the average speed and that would not do for tramways. They must, if anything, get a higher average speed.

Mr. ADAM said the average speed in Milan with regenerative control was the same as with the previous equipment.

The CHAIRMAN replied that the speed with the normal equipment was not good enough.

Mr. ADAM said that it would be better for the regenerative system to have a higher speed, but in Milan they were restricted by the other traffic.

The CHAIRMAN said that regenerative control would be watched with great interest in this country. The higher power consumption of increased average speed was well worth the result gained because the extra expense thus incurred was being amply repaid by the extra speed.

Mr. FLETCHER briefly replied to some of the points raised in the discussion, but promised a full reply in writing.

At the close of the meeting, a cordial vote of thanks was passed to Mr. C. J. Spencer for his work during the past three years as Chairman of the Council, a position which he is now relinquishing.

Kent Gas and Electricity Schemes.

Mr. R. Tilden Smith, speaking at a fête near Dover, is reported by the *Financial News* to have said that arrangements were practically completed for the treatment of part of the output of Tilmanstone Colliery by a process of low-temperature carbonisation, the principal products of which would be domestic fuel and gas. He had endeavoured to secure a market for the gas by the acquisition of a controlling interest in the East Kent Gas Co. and its rights to supply gas over an area of about 200 square miles; other gas companies in Kent were also being acquired. They would supply the companies with gas in bulk from Tilmanstone for distribution, and were advised on the highest authority that electricity could be generated in the Kent coalfield cheaper than at any other place in the United Kingdom, and it was proposed ultimately to erect a large generating station at, or near, Dover, or at the colliery, capable of producing from 100,000 to 200,000 kW of electricity, and to create industries requiring a constant supply of electricity for their processes. It was believed that over 1,000 million tons of coal lay in the area under the control of Tilmanstone Colliery.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this section.

New Graphic Instruments.

By the choice of suitable materials for their construction, Messrs. EVERETT, EDGCUMBE & Co., LTD., 117, Victoria Street, S.W.1, have developed a series of all-metal portable graphic instruments in their well-known "Inkwell" pattern, without increase of weight, so that the firm is now offering these graphers, either in wood or all-metal cases, at the same price. Both forms are equally serviceable, the type of case being largely a matter of individual preference, depending on the conditions under which the instrument will be employed. For service abroad, however, the all-metal-cased portable "Inkwell" grapher is to be recommended. The accompanying illustration, fig. 1, shows the all-metal "Inkwell" grapher with the cover removed. The case consists of two pieces only, the base, carrying all the working parts, and the cover. The joint between them is, it is claimed, an exceptionally close fit, and is secured by a pair of substantial milled-headed screws, the cover being fastened by a padlock, if desired. When the cover is removed, such of the working parts as it is necessary to handle are accessible from all sides, while at the same time the electrical movement and the working parts of the clock are entirely enclosed. Voltmeters and wattmeters have their resistances contained in the base of the instrument, which, although well ventilated, is insect proof. The new all-metal portable graphers embody, it is claimed, all the well-known advantages of the "Inkwell" pattern, such as a constant supply of ink throughout the 65-ft. roll chart, minimum friction between pen and paper, and the elimination of errors due to a varying weight of ink in the pen. A long section of the record is always visible. The charts are moved forward under the pen arm by means of pins meshing into holes on the paper itself. The instruments can be arranged so that the charts are electrically driven by a "Warren" synchronous motor which eliminates the necessity for winding and regulation, and ensures absolute synchronism between the charts of any number on the "Inkwell" graphic system, since to all intents and purposes the charts are geared by means of the frequency to a common source of power.

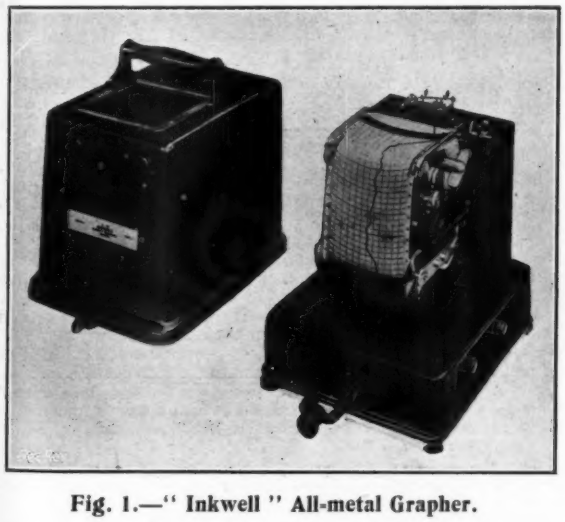
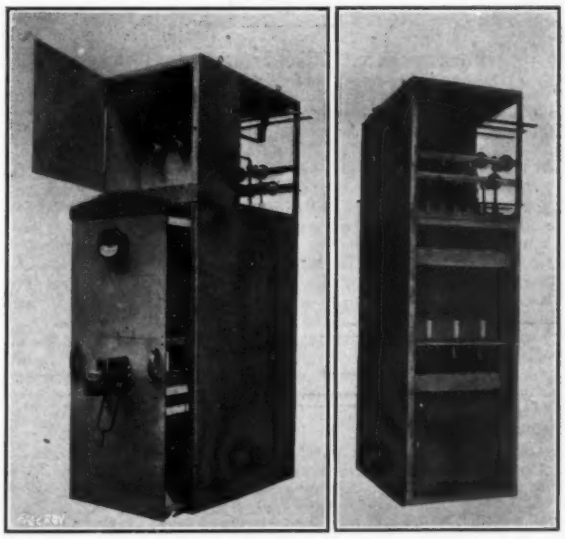


Fig. 1.—"Inkwell" All-metal Grapher.

New Truck-type Switchgear.

To provide for conditions of operation for which it is essential to maintain continuity of supply, but which, for economic reasons, the duplication of oil circuit breakers is prohibited, Messrs. FERGUSON PAILIN, LTD., Bush House, Aldwych, W.C.2, have developed truck equipment which utilises an air-break isolator to bypass the feeder oil circuit breaker and to maintain supply to the feeder *via* the bypass busbar and the busbar coupler circuit. The scheme enables overhauling of the main switching equipment to be carried out in perfect safety without shutting down, and still provides protection during the period of overhaul. This is accomplished by fitting over-current protection or over-current and leakage protection (if desired) on the busbar coupler breaker, the trip coils or protective relay being energised from a multi-ratio current transformer in the same circuit. If the load on the feeders is well balanced, a single-ratio current transformer could replace the multi-ratio transformer. As the switching equipment for the main circuit is on the movable portion, all the advantages of the truck principle are retained. For cleaning, inspection or repairs the truck can be withdrawn (after the bypass circuit is completed) to a place set apart for the purpose. From the accompanying illustrations, figs. 2 and 3, it will be seen that a standard truck cubicle is employed, but with the main busbars mounted with the bypass busbars in a detachable "fabricated" steel cubicle structure bolted on top of the truck housing. The bypass isolators, which are also located in this cubicle, are pole operated from the front, a hinged door facilitating access to them. The whole of the apparatus is accessible from the front, special constructional features being embodied to enable this to be done. The equipment is arranged for the usual methods of operation—either direct, manual, d.c. solenoid, or motor control, with automatic reclosing features if desired.



Figs. 2 and 3.—Front and Back Views of F.P. Truck Switchgear.

The truck is designed for 2- or 3-phase systems up to 900 A at 11,000 V. It is 10 ft. 4 in. high, 3 ft. wide, and 4 ft. 9 in. deep, with an additional 5 ft. to withdraw the truck. The corresponding 3-phase rupturing capacity is 100,000 kVA. The coupler equipment, which, of course, must be of sufficient capacity for the largest circuit, comprises a standard busbar coupler truck-type cubicle with the circuit breaker having the protective features outlined above, and with the super-structure carrying the extension main and bypass busbars only.

A New Wiring-System Junction Box.

A new type of junction box for use with the "Magnet" wiring system has just been introduced by the GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2. It is moulded from the maker's "Wittonite" composition, is fitted with bakelite moulded terminal heads, and has special features in design which make it eminently suitable to meet the exacting requirements of tropical situations, where the two chief factors to be contended with in the installation of electrical apparatus are insects and condensation. Neat in appear-

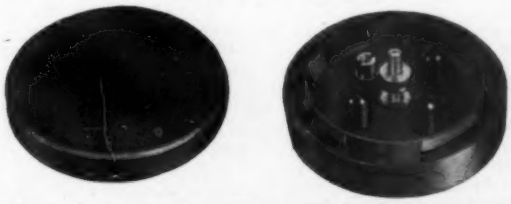


Fig. 4.—"Magnet" Wiring-system Junction Box.

ance and robust in construction, the box is suitable for use with either lead-covered or c.t.s. cables. The box is circular in shape with a smooth cover having a centrally situated recessed thread for screwing to the base. The centre screw of the base is slotted and carries a milled nut, so that a bonding wire can be rigidly gripped. There are also four wiring terminals, slotted to facilitate wiring, being fitted with bakelite moulded heads. Eight inlets are provided, so that eight twin cables up to 3/.036 s.w.g. can be accommodated after removing the guarding webs. Round the top of the base is a channel to take a plastic compound for sealing, if it is deemed advisable to seal the box.

Legal.

Farnworth v. Manchester Corporation.

IN the appeal to the House of Lords by the Corporation of Manchester in its litigation with Mr. Arthur Farnworth, regarding alleged injury resulting from the emission of noxious fumes from the Barton generating station, an interesting point has this week been raised for final decision. Mr. Farnworth claimed that his farm near the station was injuriously affected by the noxious vapours, which were also detrimental to his crops and cattle. He brought an action claiming damages and an injunction to restrain the Corporation from continuing the nuisance. Mr. Justice TALBOT gave judgment for the Corporation, expressing the view that the Corporation had shown that the station was one of a kind which the Legislature had deliberately authorised, and that there were no means by which the admitted nuisance and resulting damage could be avoided. Mr. Farnworth went to the Court of Appeal, where, by a majority, this finding was reversed and judgment entered for him for a sum as damages, to be arrived at by a referee, and at the same time an injunction restraining the Corporation from committing a nuisance was granted. Against this decision the Corporation appealed to the House of Lords, making the points that the Manchester Corporation Act, 1914, did not authorise the supply of electricity for any public or private purpose within any area, and was not a "special Act" within the meaning of Section 1 of the Electric Lighting Clauses Act, 1899; that neither Section 81 of the Schedule to that Act, nor Section 70 of the Manchester Electric Lighting Order, 1890, applied to this generating station; and that according to the true construction of the 1914 Act the Corporation was entitled to erect and use the generating station, even though it could not do so without causing a nuisance to Mr. Farnworth. It was contended that Mr. Justice Talbot was right in holding that the powers conferred upon it in 1914 could not be reasonably exercised without causing a nuisance to the respondent, and also in finding that there were no means in the present state of scientific knowledge by the adoption of which the Corporation could avoid the nuisance. It was maintained that the judgment of Mr. Justice Talbot was right, while that of the majority of the judges in the Court of Appeal was wrong, and should be reversed in favour of the former. The hearing was adjourned.

Telephones and Accessories, Ltd.

THE petition of the Erewash Electric Wire Co., Ltd., for a compulsory order to wind up Telephones and Accessories, Ltd., was dismissed by Mr. Justice Eve in the Chancery Division last week.

Mr. Johnston said it was a judgment creditor's petition which had stood over on two occasions to enable the parties to come to terms. They had done so, and he asked that the petition should be dismissed without costs.

Theft of Electricity.

AT the Hawarden Sessions last week, Alfred Sneyd, Marcott, was summoned for stealing electricity from the Hawarden R.D.C.

In defendant's house a shilling-in-the-slot meter was installed. When the collector visited the house, he found inside the meter a metal disk attached to a magnet, which caused electricity to be supplied without registering on the dial.

Mr. A. J. RICHARDSON, the Council's electrical engineer, said the metal disk was a very ingenious arrangement. He had never seen anything like it before.

Defendant said he had complained about the meter being out of order and no steps were taken to put it right. From last January he had decided to do without the service. He denied having tampered with the meter in any way. As a matter of fact he had no knowledge of electricity.

A fine of £5 was imposed, and defendant was ordered to pay the costs, making £6 16s. in all.

Correspondence.

Correspondents should forward their communications **as early as possible.** *No letter can be published unless we have the writer's name and address in our possession.*

Lady Demonstrators.

The obvious reply to "Unemployed Electrician" is that the "male member" is not charming and pretty and neat: neither is he domesticated nor a good cook.

The lady can therefore captivate the husband and instruct his wife. The male member can do neither, or, if he can, he is not the type Earl Haig had in mind, nor do we recognise him as a member of the electrical profession!

We do not employ a lady demonstrator, or I should not dare to write this letter.

A. J. Abraham.

Bexleyheath, *July 5th*, 1929.

Lamp Trading.

Referring to your kind indulgence in allowing a little correspondence last February under the above title, will you now, in fairness, kindly permit a word of congratulation to the E.L.M.A. upon the obviously thorough manner in which it has gone into the matter?

A list just to hand contains nearly two hundred names of 22 per cent. agreement holders, 174 of whom have been altogether disqualified for discounts and the remainder reduced to nearly 10 per cent.

No more need be said, excepting to take the liberty, on behalf of *bona-fide* traders, to thank the E.L.M.A. for taking a serious view of the matter and yourself for allowing the "ventilation."

J. H. Noble, *Director,*
ELECTRO-MECHANICAL SUPPLIES, LTD. (*factors*).

Coventry, *July 6th*, 1929.

The I.E.E. in France.

I have read with appreciation the lucid account of our memorable summer meeting by Mr. R. Borlase Matthews, and look forward with pleasure to the more complete illustrated paper which he has in preparation.

With regard to the Scottish centre, it has not been my intention to prepare a paper on similar lines (as stated in your current issue), but I have reason to hope that this important service will be offered by Mr. W. B. Hird, a past chairman of our Local Centre, whose intimate knowledge of the language and long experience in design makes him a fitting interpreter and commentator on the fine examples of French electrical engineering which it was our privilege to inspect.

Donald Smeaton Munro.

Edinburgh, *July 6th*, 1929.

Domestic Supply Tariffs.

There is, and can be, only one fair and accurate tariff for each and every customer, domestic or otherwise. The very conditions under which supply is given make this imperative. The many and varied tariffs that have been considered by the Advisory Committee are merely thoughtless and ill-advised attempts to catch custom during low-load time, making the poor lighting customer pay the difference.

My division of costs into (*a*) fuel, and (*b*) all other charges (which the Commissioners have adopted without any recognition of my priority of use) accurately represents the conditions of supply. The whole of the standing charges are incurred by keeping the station in a state of readiness for the turning of the switches. Until switches are turned on each and every unit of apparatus connected to the mains is equally liable for its proportion of these costs. Personally, I prefer the word "service" to "all other costs" because it really is a public service, always ready, although not always in use. The total cost of this service may be made up annually, monthly, or quarterly, and a public notice issued as to its amount. Divided by 365 and the total kW connected (which will, of course, vary for each period by the additions and disconnections) it gives the correct daily charge which has to be recovered from consumers in proportion to the amount of their connections. The total for any period, week, month, or quarter, would be the number of daily charges in that period. This charge is strictly accurate, and arises, automatically, from the division of costs that the Commissioners have adopted. The cost of fuel is regulated by the number of hours registered by the meter, and would be added.

It is also strictly fair to the consumer, and makes him his own tariff adjuster. Assume a service cost of £3 per annum, say, 2d. per day, and fuel at 0.4d. per unit. A cooker in use, say, 2½ hours per day would cost 2d. for service and 1d. for fuel, total 3d. Divided by 2½ gives 1.2d. per unit. A motor, at eight hours per day, 2d. plus 3.2d. for fuel, total 5.2d. Divided by eight gives 0.65d. per unit. Water heating, 20 hours, 2d. plus 8d. fuel, total 10d. Divided by 20, gives 0.5d. per unit. While it is strictly accurate and fair to both supplier and consumer, every inducement is given to the latter to

lengthen his hours of consumption—a far more desirable object than increasing his load. That is why I have always insisted on the term time-factor in preference to load factor.

From the foregoing, I submit that an accurate flat-rate tariff is impossible, because it cannot adjust itself to the varying conditions of either supply or demand.

Ernest G. Pink.

Blackheath, S.E.3, *July 4th*, 1929.

Water Heating Extraordinary.

A circular has recently been issued by a large electricity supply company giving the results of a test of a well-known water heater, certified by an electrical inspector appointed by the Government of India. The test data are :—7.4 gallons of water raised 44 deg. F. per hour, for which the consumption was 0.685 kWh—note the degree of accuracy implied by the last decimal. Theoretically the power required is almost exactly 1 kWh, so that the efficiency is about 40 per cent. over par. Who says we cannot beat gas!

J. W. Meares.

Guildford, *July 1st*, 1929.

A Unique Stamp.

The enclosed stamp (reproduced herewith) may prove of interest to your readers. You will note that the inscription thereon is certainly couched in more diplomatic terms than the "Nela" publicity effort on behalf of Edison. It does not claim that Edison was the first to invent the lamp, but just shows "Edison's first lamp."

From a philatelic point of view I believe the stamp is unique, in so far as this is the first time that a single electrical invention has been portrayed and honoured on a postage stamp.

Apropos, it would appear that the protests we have raised in England regarding Swan's priority claim has even penetrated the blare of trumpets in America, and somewhat taken the gilt off the Edison "fans'" ginger bread!

T. Lindon.

Hennebühl Zug., Switzerland, *July 1st*, 1929.

[Several letters reached us too late for publication this week. —EDS. ELEC. REV.]

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1927.

33,393. "Control of rotary transformer, means for coupling two alternating-current networks consisting of a synchronous and an asynchronous machine with a commutator cascade machine." Akt. Ges. Brown, Boveri et Cie. December 13th 1,926. (282,087.)

33,878. "Device for measuring or recording electric potentials or currents." B. H. C. Matthews. December 14th, 1927. (313,539.)

1928.

862. "Apparatus for the registration of electric fluctuations." H. J. Küchenmeister. January 11th, 1927. (285,503.)

1,239. "Suspension insulators." Brown, Boveri et Cie. Akt. Ges. Abteilung Installationen. January 13th, 1928. (Addition to 275,210.) (313,540.)

3,559. "Speed-regulating devices for dynamo-electric machines." British Thomson-Houston Co., Ltd., and R. D. Parry. February 4th, 1928. (313,465.)

4,358. "Dynamo-electric generators." W. R. Debenham. February 11th, 1928. (313,468.)

4,940. "Electric heat-storage stoves." J. C. P. Kirkwood. February 16th, 1928. (313,638.)

7,014. "Control of dynamo-electric machines." A. H. Midgley. March 6th, 1928. (313,509.)

7,246. "Receiving or amplifying circuit with incandescent cathode tubes having cathodes directly heated by alternating current." Siemens & Halske Akt. Ges. March 9th, 1927. (286,698.)

7,424. "Electric traction systems." A. J. Hall, W. T. Gray, and Associated Electrical Industries, Ltd. March 9th, 1928. (313,427.)

7,599. "Electric switchgear." British Thomson-Houston Co., Ltd., E. D. Regis and J. M. Goodall. March 12th, 1928. (313,475.)

7,621. "Telephones." International Electric Co., Ltd., and F. R. Baldock. March 12th, 1928. (313,478.)

7,626. "Switches and plug-in sockets or like connetcions." C. A. Turner and L. H. Wadsworth. March 12th, 1928. (313,479.)

7,780. "Electric lamps." Simplex Conduits, Ltd., and H. F. McLoughlin. March 14th, 1928. (313,644.)

7,907. "Quartz oscillator for controlling transmitter valves and oscillation generators." H. Eberhard and Radiofrequenz Ges. March 18th, 1927. (287,175.)

7,949. "Sound-reproducing devices." D. H. Johnson. March 15th, 1928. (313,646.)

8,126. "Electrical accumulators." W. Haddon and J. M. Burnett. March 16th, 1928. (313,658.)

8,216. "Electric clocks." F. Conrad. March 17th, 1927. (287,182.)

8,462. "Electric switches." British Thomson Houston Co., Ltd., and C. W. Wood. March 20th, 1928. (313,661.)

8,501. "Electric motors." A. E. White (Leland Electric Co.). March 20th, 1928. (313,664.)

8,503. "Television systems." Electrical Research Products, Inc. June 22nd, 1927. (292,546.)

8,511. "Regulating systems for dynamo-electric machines." C. Filmer and Associated Electrical Industries, Ltd. March 20th, 1928. (313,665.)

8,859. "Electrical signalling systems." I. M. E. Aitken, D. A. Gordon, and Associated Electrical Industries, Ltd. March 23rd, 1928. (313,667.)

8,882. "Electric cooking devices." British Thomson-Houston Co., Ltd. March 25th, 1927. (287,574.)

9,032. "Electric plugs." W. J. Line. March 20th, 1928. (Cognate application, 36,750/28.) (313,668.)

9,340. "Electric circuit breakers." E. Longbottom and R. Milne. March 28th, 1928. (313,671.)

9,771. "Apparatus for regulating gas or electric supply in connection with domestic stoves and the like." M. Edmunds. March 31st, 1928. (313,677.)

10,073. "Telegraph concentrator." Relay Automatic Telephone Co., Ltd., and A. C. Corner. April 3rd, 1928. (313,682.)

10,969. "Measurement of electrical energy in three-phase circuits." D. Lupi. April 13th, 1928. (313,689.)

11,147. "Electric heating elements." Santon, Ltd., and H. C. Sanders. April 16th, 1928. (313,691.)

11,467. "Thermionic valve circuits." Igranic Electric Co. Ltd., F. J. H. Charman, and F. A. Inskip. April 18th, 1928. (313,693.)

12,138. "Piezo-electric crystals." Associated Electrical Industries, Ltd. April 28th, 1927. (289,471.)

12,363. "Microphones." A. F. Pollock and D. A. Pollock. April 27th, 1928. (313,706.)

12,981. "Electrical recording instruments of the relay type." A. G. S. Sandison and Electroflo Meters Co., Ltd. May 3rd, 1928. (313,715.)

14,333. "Electric switches." J. A. Crabtree. May 16th, 1928. (313,721.)

14,377. "Loading systems for telephone lines or the like." Standard Telephones and Cables, Ltd. June 13th, 1927. (292,036.)

14,559. "Devices for supplying current to thermionic valves." P. Bruyncraede. May 17th, 1928. (313,722.)

14,695. "Excitation of synchronous dynamo-electric machines." English Electric Co., Ltd., and G. Schroeder. May 18th, 1928. (Cognate application, 18,765/28.) (313,723.)

14,980. "Metallic-vapour lamps for producing ultra-violet radiation." P. Freedman. May 22nd 1928. (313,726.)

14,981. "Electric discharge devices for producing ultra-violet radiation." P. Freedman. May 22nd, 1928. (313,727.)

15,361. "Metallic-vapour electrical discharge devices." P. Freedman. May 25th, 1928. (313,729.)

16,561. "Insulating pressure clamps for electrical apparatus." Bruce Peebles and Co., Ltd., and J. W. Rodger. June 7th, 1928. (313,745.)

16,716. "Paper-insulated multiple-conductor electric cables for carrying large currents." Kabelwerk Duisburg. June 8th, 1927. (291,769.)

16,788. "Electrostatic loud-speakers and the like." E. Reisz. December 29th, 1927. (303,131.)

17,540. "Indirectly-heated thermionic cathode." Dr. S. Loewe. June 25th, 1927. (292,913.)

18,156. "Method and apparatus for protecting transformers, switches, motors, generators, and other electrical apparatus." M. Buchholz. June 30th. 1927. (293,034.)

18,644. "Sound-reproducing instruments." H. H. Lassman. June 27th, 1928. (Cognate application, 20,170/28.) (313,764.)

19,742. "Electrical automatic temperature controllers." G. Wilkinson. July 7th, 1928. (313,775.)

19,947. "Sound-reproducing apparatus." W. H. H. Crull. July 9th, 1928. (313,778.)

20,301. "Electric switches of the truck type." International General Electric Co., Inc. July 12th, 1927. (293,805.)

20,516. "Measurement of electrical quantities." Associated Electrical Industries, Ltd. July 14th, 1927. (293,880.)

20,579. "Electromagnetic make-and-break movements and the like." H. S. Cowx. July 16th, 1928. (313,784.)

20,964. "Phonograph pick-up apparatus." Federal Telegraph Co. November 5th, 1927. (300,115.)

24,963. "Enclosed distributing switchgear, with switch apparatus, which can be drawn out or lowered." Siemens-Schuckertwerke Akt. Ges. November 5th, 1927. (300,116.)

27,533. "Electric incandescent lamps." F. J. Alderson. October 1st, 1927. (298,077.)

28,643. "Oil switches." International General Electric Co., Inc. October 6th, 1927. (298,238.)

33,382. "Vacuum electric tube devices." Westinghouse Lamp Co. November 16th, 1927. (300,613.)

36,016. "Dynamo-electric machines." F. G. Baum. December 6th, 1927. (301,838.)

36,044. "Telephone systems." Associated Telephone and Telegraph Co. August 13th, 1927. (Divided application on 8,847/28.) (301,844.)

1929.

10,916. "Partitions for separating the electrolytic products in the fusion electrolysis of chloride, particularly of magnesium." I. G. Farbenindustrie Akt. Ges. December 23rd, 1927. (Divided application on 12,432/28.) (309,408.)

12,776. "Electric motors." G. H. Fletcher, R. Brooks and Associated Electrical Industries, Ltd. March 9th, 1928. (Divided application on 312,715.) 313,429.)

Rural Electrification in Holland.

The Commercial Secretary to the British Legation at The Hague has reported to the Department of Overseas Trade that, according to the *Algemeen Handelsblad*, the Commission for Agricultural Co-operation of the Union of Co-operative Dairy Works in North Holland, at the request of and in co-operation with the provincial power station, is to supply the machinery necessary for using electricity to as great an extent as possible on farms in a district where electricity is supplied directly by the provincial power station. As regards cattle-breeding, it is intended to do everything possible by electricity, *e.g.*, lighting, milking, water pumps, manure pumps, hay-tossing, cake-breaking, cutting of beetroots, cow-clipping, curry-combing, vacuum-cleaning, ventilating, cooking of cattle cakes, heating of water, draining, &c., as well as everything possible for the household. Electricity will also be used for incubators, artificial daylight, heating, and egg-inspection. The plant will be loaned and the installation will be carried out free of charge by the provincial power station. The farmers must bind themselves to conduct the business carefully and in accordance with instructions issued by the provincial power station and the Commission, and to allow interested visitors to enter the premises and to give them information, for which they will receive a certain allowance.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ACCRINGTON.—School, Richmond Hill (£25,333), for the Borough E.C.; director of education.

AVIEMORE.—Church at Rothiemurchus; R. Pert & Son, builders, Montrose; J. N. Comper, architect, London.

AYR.—36 houses for Corporation (£12,250); Burgh surveyor.

BEDDINGTON AND WALLINGTON.—Houses (50), St. Mary's Avenue, for C. R. Leech. Houses (26), The Brandries, for W. Hunt (London), Ltd.

BEXLEY.—Houses (80), Central Avenue estate, for J. Stevens and Son.

BILLINGHAM.—Additional 100 houses for the U.D.C.; housing architect. Bank; Liverpool & Martin's Banks, Ltd.

BRADFORD.—Aerodrome; Bradford and Leeds Corporations. School (£20,300), Swaine House estate; director of education, Town Hall.

BRECON.—Bazaar premises, High Street, for F. W. Woolworth & Co., Ltd., Kingsway, London.

BRISTOL.—Ice rink, for Ice Rinks, Ltd.; Sydney Clough, architect, 444, Strand, London, W.C.

BROCKENHURST.—Secondary school; Hampshire Education Committee.

BROMLEY (KENT).—Alterations, electricity offices, for the T.C.; F. S. Chappell, architect, Oakdene, Rushmore Hill, Knockholt (returnable deposit of £2 2s.).

CARSHALTON.—Shopping centre and development of Sutton Park estate, with 500 or 600 houses, for the Onyx Property Investment Co. Church of the Good Shepherd (£10,000); Martin Travers, architect, London, W.

CHALFONT ST. PETER.—School for Bucks E.C.; director of education, Aylesbury.

CHELTENHAM.—Extensions printing works, Swindon Road; Cheltenham Press Co. Housing scheme (4 acres), Waddon Road; rehousing scheme, St. Paul's area; borough architect.

CHERITON (KENT).—Public hall, for the Folkestone Co-operative Society, Ltd.; secretary.

CHESTERFIELD.—Factory, Walton, for Robinson Bros., Ltd.

COULSDON (SURREY).—R.C. church, Chipstead Valley Road; Sir Gilbert Scott, architect.

DAGENHAM (ESSEX).—Re-erection of sawmills (electrically equipped), The Dock, for Samuel Williams & Son, Ltd.

DEAL.—Central school for the borough E.C.; clerk.

DERBY.—Motor showrooms, garages and offices, for F. Kenning & Sons; Wilcockson & Cutts, architects, Chesterfield (returnable deposit of £2 2s.).

DEWSBURY.—Girls' secondary school (£48,900), for the borough E.C.; director of education.

DONCASTER.—School, Tickhill (£35,570), for the borough E.C.; Walker & Thompson, architects. Extensions, senior boys' school (£17,425), for the borough E.C.; Blythe Richardson, architect.

DOUGLAS (ISLE OF MAN).—Pier extension scheme; W. H. Blaker, engineer to the Harbour Authority.

DUMFRIES.—Warehouse, five shops, offices, &c. (£10,000), for W. B. Anderson & Sons; the manager.

EASTBOURNE.—78 houses, West Crescent and Gilbert sites; borough engineer. Houses on Park Close estate, for Park Close, Ltd.; F. G. Lovell, architect. Alterations and additions, Bobby's premises, Lismore Road; Debenhams, Ltd. Alterations and additions, 140-4, Terminus Road; J. Lyons, Ltd.

EDINBURGH.—New George Watson's College (£200,000); J. B. Dunn, architect. R.C. school and college (£600,000); Reid & Forbes, architects, 7, Ainslie Place.

ELSTOW.—School and practical subjects centre for Beds. E.C.; county surveyor, Shire Hall, Bedford (returnable deposit of £1 1s.).

EPPING.—Conversion of buildings to central school; Church of England managers.

EPSOM.—Cinema, Church Street, for J. G. & R. B. Wainwright, 6, Piccadilly Mansions, London.

GLASGOW.—Municipal aerodrome (£60,000); city engineer.

GUILDFORD.—Municipal offices, High Street (£13,000); W. Bullen & Son, builders.

HARTINGTON (BUXTON).—Re-erection of factory for J. Nuttall & Co. (£10,000).

HORNCHURCH.—Senior school (£17,873), for Essex E.C.; J. Stuart, county architect, Chelmsford.

HOUNSLOW.—38 houses, Summerhouse Avenue and Victoria Gardens; William Harbrow, Ltd.

HULL.—Houses and shops, New Street area; city architect. Operating theatre, Infectious Diseases Hospital (£6,500); city architect.

IRISH FREE STATE (NAAS, Co. KILDARE).—Additions, County Hospital; D. J. Purcell, secretary (deposit £2 2s. not returnable).

(ABBEYLEIX, QUEEN'S Co.).—Alterations to District Hospital including installation of electric lighting; D. Heaney, borough engineer, Thurles, Co. Tipperary.

KIDDERMINSTER.—Carpet works extensions, Duke Street, for Tomkinsons, Ltd.

KINGSTON-ON-THAMES.—Additional 94 houses, Norbiton estate, for the T.C.; borough surveyor.

LONDON (BOW, E.).—Elementary school, Back Alley (£18,000); L.C.C. architect.

(BERMONDSEY, S.E.).—Library and maternity centre, Silver Street (£16,434); building works manager.

(CATFORD, S.E.).—Cinema, Bromley Road; W. J. King.

(PUTNEY, S.W.).—Widening bridge (£433,000); L.C.C.

LOWER INCE (WIGAN).—Electric lighting installation, St. Mary's schools; Rev. S. Bryson, vicar.

MACCLESFIELD.—Re-erection of silk mill, for the West Bond Street Manufacturing Co., Ltd.; G. W. Chambers, manager.

MAIDSTONE.—Re-erection, business premises, Lower Stone Street, for the Co-operative Society; secretary. School, Loose Road, for the borough E.C.; T. F. Bunting, borough surveyor (returnable deposit of £2 2s.). Development of London Road estate, with 80 houses and shops; Cox Bros., 22, Lower Stone Street.

MANCHESTER.—Reconstruction of Union Bank premises, Oxford Street; contractors, Peace & Norquay, Ltd., New Islington Works. Housing scheme, Chorlton estate extension (£416,000); city engineer. Waterworks (£170,000); water engineer.

MARGATE.—School, for the borough E.C.; Foster & Barber, architects, 183, Northdown Road, Cliftonville (returnable deposit £2 2s.).

OLDHAM.—Town Hall extension; Corporation Finance Committee.

ORSETT.—School extensions, Corringham school (£3,000); H. E. Jerram, East Ham.

OXFORD.—Girls' school, Headington (£40,000); G. T. Gardner, architect, 7, St. Aldates. Bank, Carfax (£25,000); Glyn, Mills, Currie & Co., bankers, London. Extensions, Bisney Lane; Alden Press, Ltd. Extensions, New Inn Hall Street; County Press, Ltd.

PAISLEY.—Factory, Harbour Road, for Seigwart Fireproof Flooring Co., 331, Strand, London; manager.

ROCHFORD.—Central school, for Essex E.C.; director of education, Chelmsford.

ST. AUSTELL.—Hotel (£25,000), with central heating, electric lighting and lifts; Andrew & Randall, architects; John Williams & Sons (Cornwall), Ltd., builders.

ST. NEOTS (HUNTS.).—Re-erection of the Pavilion Theatre; proprietor.

SHEFFIELD.—Extensions, Isolation hospital (£17,540); W. C. Robson. Printing works, Scotland Street (£14,350); city engineer.

SIBFORD (BANBURY).—School for the Society of Friends (£17,000); J. T. Harrod, headmaster.

SOUTHAMPTON.—Civic centre, for the T.C.; E. Berry Webber, architect, 2, New Square, Lincoln's Inn, London, W.C.

STOURBRIDGE.—Church, South Road, for the Trustees of St. Thomas's Church; vicar.

TORQUAY.—200 houses, Hele; borough engineer. School, Barton Hill Road; Education Committee. Harbour improvement (£35,000); harbour engineer.

WESTGATE-ON-SEA.—Schools, for the Roman Catholic Managers, Tower House.

YORK.—'Bus garage, Fulford (£10,000); tramway manager.